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for the "NEW" Railroading . . . .

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REPUBLIC STEEL

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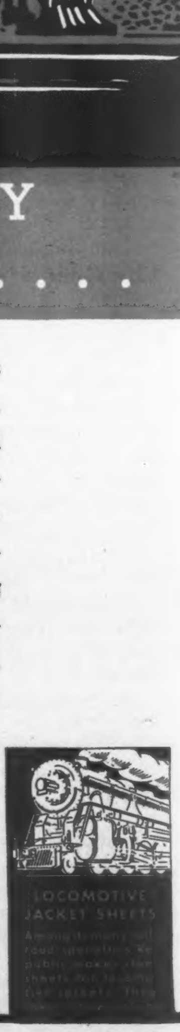


Stainless Steel

Coach for the Santa Fe

Built with de luxe facilities for long-distance travel by the Edward G. Budd Manufacturing Co., the car weighs less than 42 tons, ready for service — Full center-sill strength requirements are met

A light-weight passenger coach, the body of which is fabricated of stainless steel by the Shotweld process, has been delivered to the Atchison, Topeka & Santa Fe by the Edward G. Budd Manufacturing Co., Philadelphia, Pa.

Although of full conventional width and designed for use in long trains of heavy cars, with center sills capable of withstanding more than the maximum required buffing load of 400,000 lb., the light weight of the car, ready for service, is only 83,530 lb., which is about half as much as an ordinary Santa Fe chair car. The car body, completely equipped, weighs on the center plates 52,000 lb., of which 14,000 lb. is accounted for by the stainless steel in the structure. The trucks weigh 28,800 lb. The remainder of the service weight is made up of water and supplies. A comparable conventional Santa Fe passenger car weighs about 160,000 lb. light. This coach will be operated in regular service on the heavy main-line trains of the Santa Fe to develop fully the facts as to the serviceability of a car of this type of construction when used interchangeably with heavy standard equipment.

Over the buffers the car is 79 ft. 8 in. long. Over the side rails the width is 10 ft. 1/8 in., and inside it is 9 ft. 3¼ in. The height from the rail to the top of the roof is 13 ft. 6 in. The car has an oval, or turtleback form of roof and the sides end in inwardly curving skirts which extend 13⅜ in. below the bottom of the underframe cross members. A vestibule is provided at one end of the car only.

While equal in size to an 80-passenger coach, it has seats, spaced on 41½-in. centers, for only 52 passengers. The remaining space is devoted to lounging rooms and toilet facilities comparable to those in Pullman cars. At one end of the car is a spacious smoking room for women with four individual chairs, a dressing table and chair, and a full length mirror. At the other end of the car is the men's lounge which seats six, four on a davenport across one end and two in individual chairs.

The Body Structure

The same general principles of construction previously employed in the light-weight articulated trains built by the Budd Company are followed in the construction of this coach. These are the use of structural members of thin-gage stainless steel formed by rolling or folding to provide sections of the required stiffness and joined by the Shotweld process. The type of sections used in this car, however, show considerable modification from those characteristic of the earlier trains. In the trains the

The Atchison, Topeka & Santa Fe de luxe chair car of stainless steel construction

Interior of the passenger compartment

frame of the structure is made up of flanged box sections fabricated in truss form. The characteristic feature of the Santa Fe design is the replacement of the truss members by open sections of inwardly flanged channel form. Those for the cross members of the underframe are 8½ in. deep and the side posts 10½ in. deep. The use of open sections, reinforced where necessary by tie straps across the open side or by fillers, not only simplifies the construction of the sections themselves, but also facilitates the entire fabrication of the structure.

The underframe structure consists essentially of center sills of top and bottom channel sections which are supported by channel cross bearers and tied together at the sides with corrugated vertical webs between the cross bearers. The center-sill channels are 12 in. wide by 1½ in. deep, with 1½-in. outwardly extending flanges parallel to the web. Each channel is formed in two parallel pieces joined on the longitudinal center line by welding through the vertical center flanges and each is reinforced by two 3-in. channels placed within the main channels and welded through their webs to the web of the main channel.

The cross members, which are spaced 27 in. apart, are 8½ in. in depth by 1½ in. in width and, like the center sills, are of $\frac{1}{16}$-in. stainless steel. The flanges are ell-shaped with the legs which are parallel to the web extending inward toward each other and partially closing the open side of the member. These channels are joined by welding to the webs of the top and bottom center-sill channels and at the ends to the side posts. Five longitudinal floor stringers on each side of the center sill rest upon the top of the cross members and form the support for the corrugated stainless steel floor sheets. These longitudinal members are of channel section, with the outwardly extending flanges on the open side welded to the cross members. Flanges accessible for welding to the floor are provided by strips of suitable width welded to the backs of the channels.

The bottom chord member of the side frame consists of a side sill of zee section attached to the bottoms of the posts and the curved skirt which extends below the underframe. This skirt is a corrugated sheet attached to vertical supports at each cross member.

At the ends of the cars the center sills are attached to Cromansil combined sill and bolster structures of Lukenweld construction.

The center sills are designed to withstand a 400,000-lb. buffing load. Because of the distribution of end-load stresses over the entire underframe and floor structure and into the sides of the car, the structure as a whole is capable of withstanding a materially greater load.

The principal members of the side frame are 10½-in. channels of $\frac{1}{16}$-in. stainless steel similar in form to the cross members of the underframe, except that the width of the section is 3 in. These channels are tied together at the longitudinal rails, one of which is located between the side sheathing and the skirting at the side sill, one between the top of the letter board and the roofing, and two members, one above and one below the windows.

The outside sheathing below the windows is in the longitudinal concave panel form characteristic of this builder. A change has been made, however, in the method of attaching the panels to the frame members. As originally developed these panels were welded together at their internally projecting flanges and the flanges were welded to clips at each side post. This arrangement permitted the sheets to adjust themselves to the deflection of the frame structure without noticeable warping of the exterior surfaces. The method which has since been developed and which is employed on the Santa Fe coach is shown in one of the drawings. The panels are formed with angle flanges, one leg of each flange turning outward, parallel to the car side frame. In assembling the flanges of adjacent panels are overlapped and secured to the faces of the side posts with machine screws. This leaves an opening between the edges of adjacent panels which is $\frac{39}{64}$ in. wide. Under the head of each machine screw is secured a spring clip. Long channel caps formed to slip over the spring clips

Interior of the women's lounge

and be held in position by them are then inserted in the slot-like openings between panels. By removing the plate which encloses the ends of the sheathing panels the caps may be removed by the insertion of a suitable bar at the end and working them out. The caps add a pleasing beaded effect at the joints between the panels.

The surface of the sheathing between the windows is flat, while that above the windows and on the roof is formed in narrow corrugations, except for that portion of the letter board on which the name of the road appears, which is flat.

The roof, which serves as a stiff top chord member of the structure, is made up of carlines of channel form with the corrugated roof sheets welded in place on the outside. At the ends of the car a top collision bulkhead is formed by a flat reinforcing sheet applied over the carlines for a distance of 48½ in. back from the end of the car.

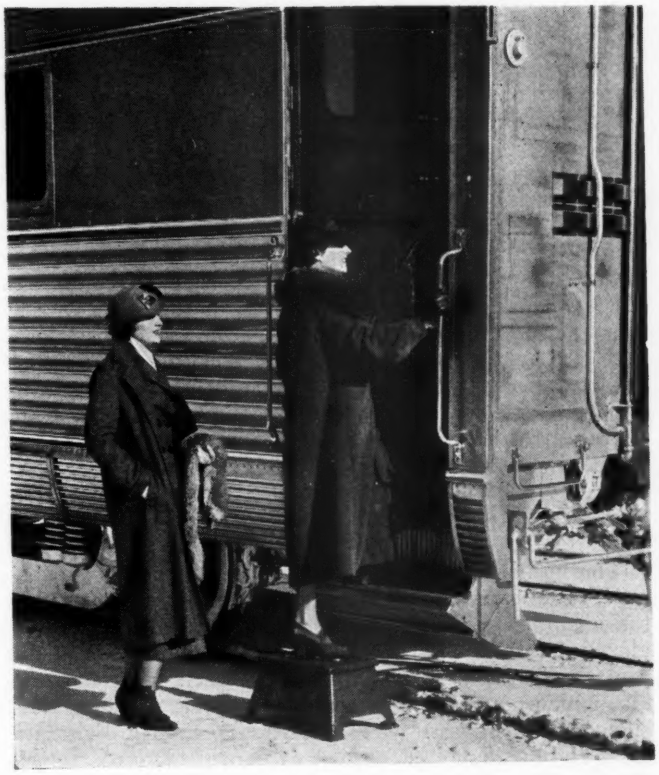
End posts built up of stainless steel in deep, relatively heavy sections are securely framed into the underframe at the bottom and into longitudinal members securely attached in the reinforced portion of the roof at the ends. Any load applied directly against these end posts is resisted at the top by the entire roof structure.

The entire car body is insulated with 3-in. Dry-Zero airplane blanket. The sides above and below the windows and the ceilings are finished with Masonite Presdwood which forms the foundation for the Flexwood interior finish. The windows are of double shatterproof glass with nitrogen hermetically sealed between the inner and outer panes to prevent the collection of moisture, resulting in steaming and frosting. All partitions within the car are tied into the body structure and designed to serve as bulkheads.

The floor, which is built up on the corrugated stainless steel sheet covering the entire underframe, consists of cork fillers in the corrugations covered with a 1-in. cork sheet. To the cork surface is attached the linoleum wearing surface. Below the floor is a 3-in. airplane blanket of Dry-Zero held in place by a light stainless steel sheet welded to the under side of the underframe members.

The vestibule is closed by the usual trap door and side door, the latter divided into upper and lower sections. The steps on each side are built as a unit and are hinged to the car by trunions about 5 in. under the top tread. By means of a push rod attached to the

The men's lounge



The hinged steps are opened and closed automatically with the vestibule trap door

under side of the trap door the closing of the latter swings the bottom of the steps up to close the side of the step well. Skirting is so attached to the step structure that with the vestibule closed the surface of the side of the car below the door is unbroken across the step well. The steps remain immovable in their open position so long as the vestibule trap door is open.

Air Conditioning and Heating

The cars are equipped with the Safety-Carrier air-conditioning system and Vapor steam-heating equipment.

The refrigeration unit is placed beneath the car. The condenser air inlet and outlets are in the skirt, the design of these openings being such as to blend with the car construction. The refrigeration unit is fitted with automatic devices which make possible the operation of the equipment through runs where outside temperatures requiring cooling and outside temperatures below freezing are encountered, without servicing enroute.

The air-conditioning unit is mounted over the men's lounge. Complete access for servicing is possible through inspection doors in the ceiling. Conditioned air is delivered to a center duct for distribution through the car.

Outside air is taken in through louvres in the side of the roof and through filters placed vertically in the space between the roof and ceiling. Sufficient filter area for outside air is provided so that all the air circulated through the car may be outside air. A single control operates the dampers at the outside air inlet and the return air grille to give the desired make-up to the air circulated in the car. When the cooling system is in operation the proportion of outside air must be limited to 25 per cent, but when cooling is not required the proportion of outside air may be increased to 100 per cent, resulting in much better car conditions than when the lower content of outside air is maintained under all conditions.

By the selection of light materials and a design which realizes to the fullest extent the saving possible with those materials the weight of the equipment, including a water supply for a ten-hour run, has been decreased 35 per cent from the weight of previous equipment of equal capacity.

The duct for air distribution is located under the center of the roof and above the ceiling. Below the center of the ceiling is an outlet duct running the entire length of the passenger compartment of the car, the under side of which is finished in a stainless steel panel. Grille openings, placed at intervals in the sides of this duct, admit the conditioned air to the car body. The heat exchange equipment is provided with both the cooling and heating elements, the overhead heating being supplemented with the usual floor line radiators. The operation of the heating and air-conditioning equipment is thermostatically controlled through a Vapor control panel.

Lighting

The lighting of the interior of the passenger compartment is provided from two sources. Alternating between the air inlet grilles in the sides of the ceiling duct are placed Transilux fixtures, eight on each side. These provide a semi-indirect lighting, diffused from the ceiling, which may be dimmed for night use. On the under side of the luggage rack over each seat is a Prismatic Lens light which is designed to provide from 7 to 8½ foot candles at the reading plane for seated passengers. These lights are turned off at night.

The lounges are provided with wall Louvelites and Columlites at the lavatories and dressing table. A canopy light is provided for the full-length mirror in the ladies' lounge. Ceiling lights of the Prismatic Lens type are provided in the corridors. The fixtures were furnished by the Safety Car Heating & Lighting Company. Other features of the lighting equipment are the Safety control panel and Exide 850-amp.-hr. battery.

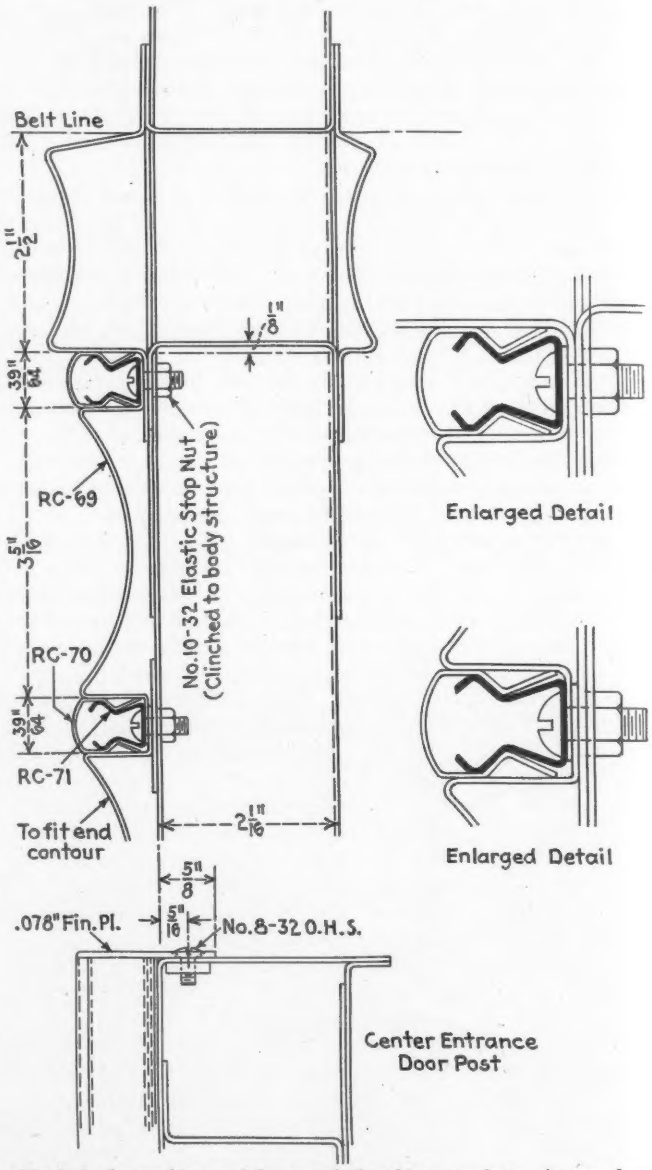
Trucks

The car is carried on four-wheel trucks with 5-in. by 9-in. journals, fitted with Satco bearings. The wheels are two ear, rolled steel, finished with cylindrical treads, 35 in. in diameter. The wheel base of the trucks is 9 ft. and they are spaced 53 ft. between centers.

The truck frames and bolsters are of nickel cast steel and are designed for the usual equalizer type of spring suspension. The bolsters are fitted with lateral hydraulic shock absorbers, and sound insulating inserts of rubber have been applied. The trucks are equipped with the Unit Cylinder type clasp brakes.

The car is equipped with Miner light-weight type draft gears and buffers, and Alliance alloy-steel couplers. The air brakes are Westinghouse UC type.

The design of this car was developed jointly by the engineering staff of the Atchison, Topeka & Sante Fe and the Edward G. Budd Manufacturing Co. Sterling

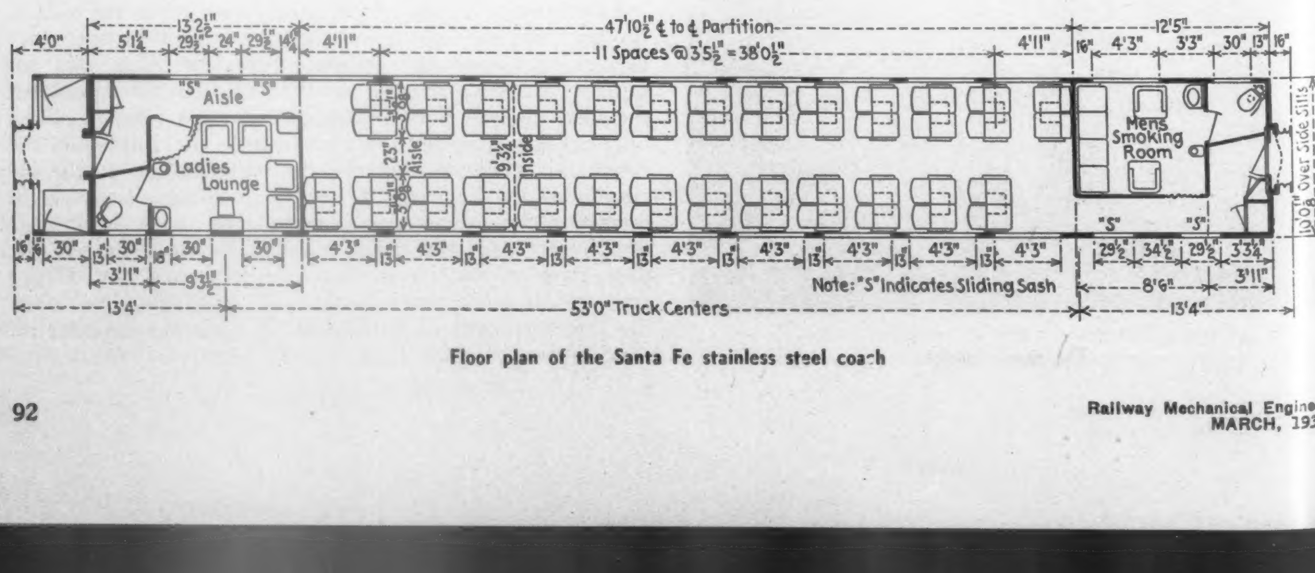


Method of attaching stainless-steel sheathing panels to the car frame

B. McDonald of Chicago collaborated in the preparation of the interior decorations and the color selection.

Interior Finish

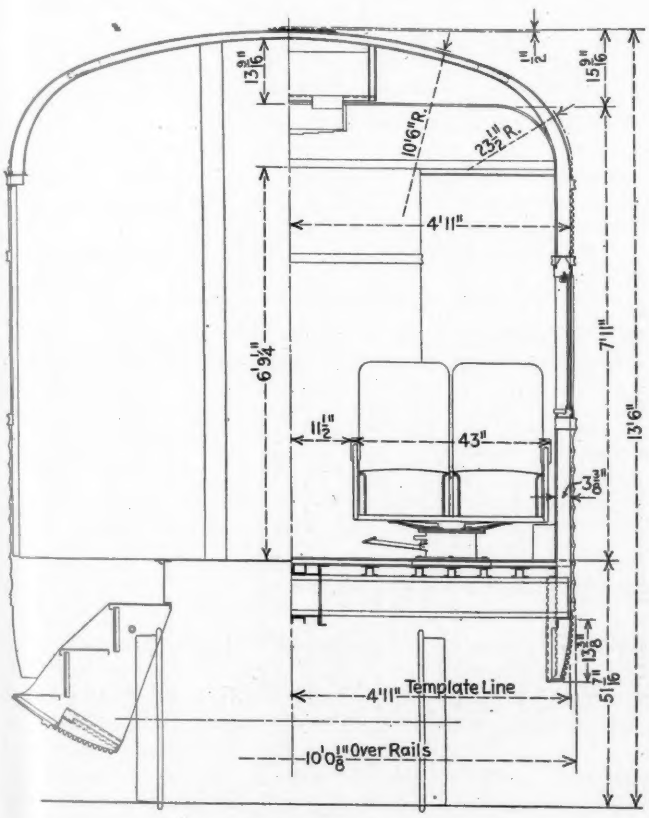
The interior walls of the cars are finished in Flex-



Floor plan of the Santa Fe stainless steel coach

wood veneer on Presdwood or steel. American walnut is used from the floor to the polished stainless-steel window rail, a brown oriental wood in the panels between the windows and on the partitions and prima vera, similar to a light oak, on the under side of the overhead baggage racks. The ceiling of the passenger compartment is finished in a light ivory. The walls of the ladies' lounge are finished in harewood, with a medium gray ceiling. Both walls and ceiling of the men's lounge are finished in quartered oak, with a beam effect on the ceiling.

The floors are finished in linoleum. That in the main passenger compartment is a brown jaspe, with a large diamond pattern in the aisle strip outlined by stripes of yellow and with a black border along the ends of the seats. In the ladies' lounge a plain jade linoleum, with a wide evergreen border, is used. That in the men's



Cross-section of the Santa Fe coach

lounge is also a plain jade with a wide border of black.

The main passenger compartment is furnished with Karpen revolving type double seats with individual backs which are easily adjustable by the passenger to three positions and are fitted with Dunlopillo rubber cushions. The upholstery is a Massachusetts two-tone gray-green frieze, in which the all-over pattern is expressive of the giant cactus and the palm tree. The furniture in the ladies' lounge is upholstered in a light tan figured fabric. In the men's lounge the upholstery is maroon leather.

The windows are fitted with roller type shades, the rollers being housed in recesses formed in the longitudinal rail over the tops of the windows. Outside, the shades are finished in aluminum, which accords in color with the stainless steel exterior of the car and acts as a heat-reflecting surface. On the inside the green of the shades harmonizes with the gray-green of the seat upholstery.

What About Mechanics and Supervisors for the Future

*By E. C. Williams**

The average railroad man of today is 40 years of age, or older, and in a few more years will pass on over the hill and out of the picture. Our railroads are giving little thought to the training of the younger generation to take care of this critical situation; only a few young men are serving any kind of apprenticeship in our railroad shops today. In ten short years the average mechanic of today will be retired from service or will have passed away.

Who will step in and carry on? We can't say that the mechanics who have been laid off during the days of depression will be the ones, because Old Father Time will also have them, since they will be past the age limit.

Many will say that the apprentices will step in and carry on, but this is also untrue, since apprentices in railroad shops today are almost as scarce as the buffaloes on the plains.

This matter is far more serious than most of us realize. I sincerely hope that some of the leaders will see how vital it is to the future of our railroads, and will make efforts to correct it now, while there is yet time.

In a few years more the equipment that is now in service will be obsolete and will be replaced with modern designs, and then the railroad officials will realize that we, the mechanics of today, are also obsolete and very much out-of-date and will, of course, be of little use, since we were trained to make repairs to the obsolete equipment and our age will not permit us to learn the trade all over again.

I would like to say for the benefit of the young men who are serving their apprenticeship in various shops throughout the country, that I don't believe anyone has a brighter future before them. If they will only apply themselves and do everything in their power to learn about the modern equipment, these young men will be the leaders of the railroads of tomorrow.

An apprentice working part-time, as has been the custom in the past, will put in approximately six calendar years before his apprenticeship is completed, and he is qualified as a journeyman. Then there is another lapse of three to five years of work and experience that he must go through before he can really render the service he should to the company that employs him.

The point that I am trying to stress is this—if all railroads were filled to capacity with apprentices now, it would be a matter of from eight to ten years before the majority of them would have acquired the knowledge and ability to carry on. Many, many of the older men will be gone on by that time, so the railroads have a very serious situation confronting them. Let us hope it will be corrected before it is too late!

* Boiler Foreman, Kansas City Southern, Shreveport, La.

RAILROAD, PENNSYLVANIA.—"Railroad, Pennsylvania," is on the Pennsylvania Railroad. It is on a railroad, yet has no railroad station. Shrewsburg, York County, is the station. "Railroad" is a post office. Yet Shrewsburg, which is 1¼ miles from the railroad, named the town of "Railroad." Years ago (Shrewsburg is over 100 years old) the people of this town would say, "I'm going over to the railroad" or "let's go over to the railroad!" Later when a few buildings were erected at the railroad they "dubbed" it "Railroad" and it still carries that name.

Detroit, Toledo & Ironton 2-8-4 type locomotive for main line freight service. Built by the Lima Locomotive Works, Inc.

General Dimensions, Weights and Proportions

Railroad	D. T. & I.
Builder	Lima Loco. Wks.
Type of locomotive	2-8-4
Road numbers	700-703
Number of locomotives	4
Date built	1935
Service	Freight
Dimensions:	
Height to top of stack, ft. and in.	15-4 7/16
Width overall, in.	10-9½
Cylinder centers, ft. and in.	92½
Weights in working order, lb.:	
On drivers	248,600
On front truck	53,900
On trailing truck	109,000
Total engine	411,500
Tender	361,370
Wheel bases, ft. and in.:	
Driving	16-9
Rigid	11-2
Engine, total	39-3
Engine and tender, total	86-1¼
Wheels, diameter outside tires, in.:	
Driving	63
Front truck	33
Trailing truck	33-45
Engine:	
Cylinders, number, diameter and stroke, in.	2-25 × 30
Valve gear type	Walschaert
Valves, piston type, size, in.	14
Maximum travel, in.	8
Steam lap, in.	1 7/16
Exhaust clearance, in.	1. & 1.
Lead, in.	3/16
Cutoff in full gear, per cent	85
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	250
Diameter, first ring, outside, in.	88
Diameter, largest, outside, in.	100
Firebox, length, in.	132⅛
Firebox, width, in.	96¼
Height mud ring to crown sheet, back, in.	65½
Height mud ring to crown sheet, front, in.	94¾
Combustion chamber length, in.	27
Arch tubes, number and diameter, in.	5-3½
Tubes, number and diameter, in.	77-2¼
Flues, number and diameter, in.	202-3½
Length over tube sheets, ft. and in.	18-0
Net gas area through tubes and flues, sq. ft.	10.1
Fuel	Soft coal
Stoker	Standard-MB
Grate type	Firebar
Grate area, sq. ft.	88.3
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	318
Arch tubes	48
Firebox, total	366
Tubes and flues	4,127
Evaporative, total	4,493
Superheating (Type E)	1,795
Combined evap. and superheat	6,288
Feedwater heater, type	Worthington-5SA
Tender:	
Style or type	Rect. W.B.
Water capacity, U. S. gal.	22,000
Fuel capacity, tons	22
Trucks	6-wheel
Journals, dia. and length, in.	6½ × 12
General data, estimated:	
Rated tractive force, engine, 85 per cent, lb.	63,250
Speed at 1,000 ft. per min. piston speed m.p.h.	37.5
Piston speed at 10 m.p.h., ft. per min.	266.7
R.p.m. at 10 m.p.h.	53.35
Boiler, evap., (with heater) (Cook) lb. per hr.	65,642
Equiv. evap. per sq. ft. evap. h. s. per hr.	14.62
Weight proportions:	
Weight on drivers ÷ weight, engine, per cent	60.4
Weight on drivers ÷ tractive force	3.92
Weight of engine ÷ evaporation	6.27
Weight of engine ÷ comb. heat surface	66.44
Boiler porportions:	
Firebox h. s. per cent comb. h. s.	5.8
Tube-flue h. s. per cent comb. h. s.	65.6
Superheat, surface per cent comb. h. s.	28.55
Firebox h. s. ÷ grate area	4.15
Tube-flue h. s. ÷ grate area	46.7
Superheat. surface ÷ grate area	20.35
Comb. h. s. ÷ grate area	71.2
Gas area, tubes-flues ÷ grate area	0.104
Evaporation ÷ grate area	744
Tractive force ÷ grate area	716
Tractive force ÷ evaporation	0.96
Tractive force ÷ comb. h. s.	10.05
Tractive force × dia. drivers ÷ comb. h. s.	634

Rolled Frames in

D. T. & I. Locomotives

Lima builds four 2-8-4 type locomotives, weighing 411,500 lb. and having a tractive force of 63,250 lb., which have frames cut from rolled-steel slabs

The Detroit, Toledo & Ironton has received from the Lima Locomotive Works, Inc., four locomotives of the 2-8-4 type, numbered 700 to 703 inclusive, which will be operated on the main line in heavy freight service. These locomotives weigh 411,500 lb. in working order, the distributions being 248,600 lb. on the drivers, 53,900 lb. on the front truck and 109,000 lb. on the trailing truck. The boiler pressure is 250 lb. the two cylinders are 25 in. in diameter with a stroke of 30 in., and the diameter of the driving wheels is 63 in. These proportions give the locomotive a rated tractive force of 63,250 lb.

These locomotives are the first ones with this wheel arrangement to be used on the D. T. & I. The first 2-8-4 type locomotive was built by the Lima Locomotive Works, Inc., in 1925 and up to date there are 302 locomotives of this type in service on ten American and Canadian railroads. In regard to tractive force, grate area and heating surface, the D. T. & I. locomotive rates as one of the smallest of the 2-8-4 type, although several other designs have a lower total weight.

Frames Cut from Steel Slabs

The outstanding feature of these locomotives is the frames. These have been cut out of rolled-steel slabs. The material used is a normalized and tempered carbon steel possessing a high degree of homogenity. This quality and the high physical properties of the material are indicated in one of the tables. The location of each test piece included in this table is indicated on the frame diagram. From this it will be seen that two test pieces were taken out of the metal removed from each pedestal, one taken out near the top and one near the bottom, and one specimen from the metal removed below the front rail of the frame. The maximum variation in yield point is between 40,540 lb. and 45,180 lb., while the maximum variation in ultimate strength is between 71,800 and 79,940 lb. The elongation is confined between 29.5 and 32 per cent and the reduction in area between 53.3 and 56 per cent. The rolled-steel slab frame and its production have been developed by the Lima Locomotive Works, Inc., working with the Carnegie-Illinois Steel Company.

The thickness of the frames is 6 in. and they are spaced on 40 in. centers. The frames are joined together by the usual transverse cast-steel bracing, including rear deck and front bumper castings.

Clearance restrictions limited the height of the stack to 15 ft. 4 7/16 in. above the rail and the width overall to 10 ft. 9 1/2 in.

The boiler carries a steam pressure of 250 lb. The first shell course has an outside diameter of 88 in., the second course is conical, and the third or dome course has an outside diameter of 100 in. The design provides a generous steam space above the water level. The fire-

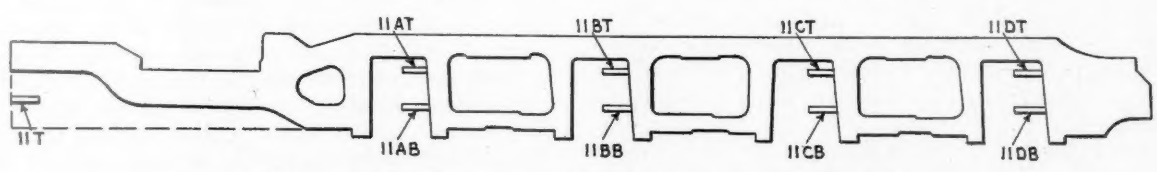
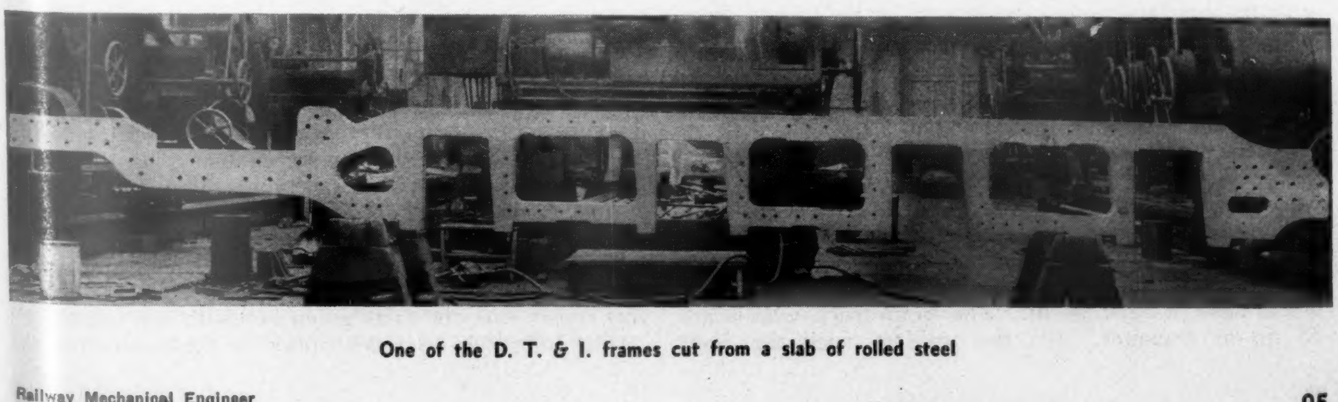


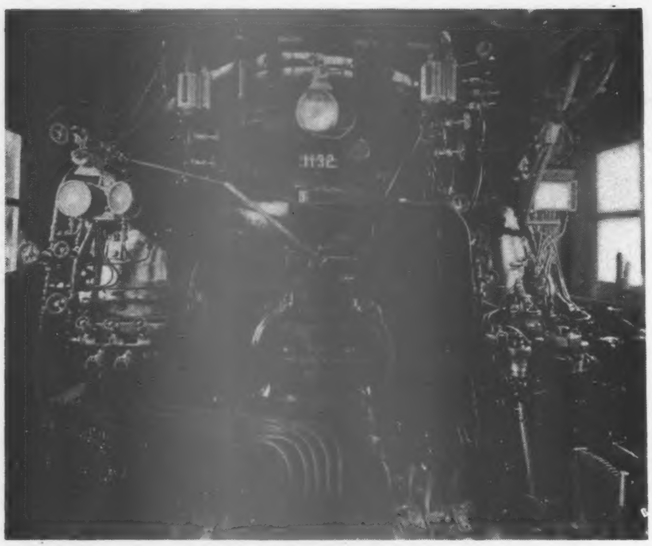
Diagram of the D. T. & I. frame showing location of the test specimens

Tests of Rolled Steel Frames—D. T. & I. 2-8-4 Type Locomotives

Test identification	Yield point, lb. per sq. in.	Ultimate strength, lb. per sq. in.	Elongation, per cent	Reduced dimensions, per cent
11-T	44,640	78,940	30.0	54.7
11-AT	43,130	78,930	31.0	53.3
11-AB	44,180	79,430	29.5	53.3
11-BT	45,180	79,940	32.0	53.3
11-BB	43,730	79,780	30.0	53.3
11-CT	42,990	79,680	30.0	53.3
11-CB	43,980	78,240	31.0	54.7
11-DT	40,540	71,800	29.5	54.7
11-DB	42,230	73,340	31.0	56.0



One of the D. T. & I. frames cut from a slab of rolled steel



Interior view of cab showing back boiler head arrangement

box, 132⅛ in. long and 96¼ in. wide, has a combustion chamber extending 27 in. forward of the throat. The Security brick arch is carried on five 3½-in. arch tubes. The slope of the crownsheet is 6¼ in. and that of the grate 23 in. The shell contains 77 tubes, 2¼ in. in diameter of No. 12 gage, and 202 flues, 3½ in. in diameter of No. 11 gage, the length of the tubes and flues being 18 ft. 0 in. The grates are of the Firebar type and the fuel, soft coal, is fed by a Standard Type MB stoker. The stoker engine is located on the tender in a compartment formed in the left-hand water leg.

The superheater is a Type E, and an American multiple-throttle is incorporated in the superheater header. A Worthington feedwater heater, Type 5SA, is fitted and this is supplemented by a Sellers Class S non-lifting live steam injector.

The two-cylinders, 25 in. in diameter by 30 in. stroke, are of the half-saddle type and spaced 92½ in. between centers. In addition to the usual bolting the cylinders are joined to the frames by welding and the bolted joint between the two cylinder castings is also reinforced by welding. The piston valves, which are actuated by a Walschaert gear, are 14 in. in diameter and have a maximum travel of 8 in. Care was taken to furnish large capacity live and exhaust steam passages. The distributing valves have a steam lap of 1$\frac{7}{16}$ in. and a lead of $\frac{3}{16}$ in. in full gear. No exhaust clearance is provided, the valves and ports being line and line. The reverse gear is an Alco Type G.

Crossheads and guides are of the multiple-bearing type. A Tandem main rod, 125 in. long, connects to the crank pin on the third pair of drivers with an extension to the rear drivers, and side rods connect the first and second pairs of drivers to the main crank pin.

The driving wheel base is 16 ft. 9 in., the 63-in. driving wheels being uniformly spaced 67 in. between axle centers. There is an Alco lateral cushioning device for the driving boxes on the front wheels which permits of a movement of ⅝ in. to each side of the center line and reduces the rigid wheel base to 11 ft. 2 in. The distance between the front truck wheels and the first pair of drivers is 116 in. and from the rear drivers to the front wheels of the trailing truck is 84 in.

The two-wheel front truck is a General Steel Castings constant-resistance design, having outside journals. The four-wheel trailing truck is of the Delta type with a wheel base of 5 ft. 10 in. The front truck wheels are 33 in. in diameter. On the trailing truck the front wheels are 33 in. in diameter; on the back wheels, 45 in. in diameter. While a booster was not applied at the time the engines were built provision was made for a future application should this be desired.

The cab is of the vestibule type and has Lima Comfort cab seats. The brake equipment is New York, schedule 6 ET, with two 8½-in. cross-compound air compressors located on the front deck. A Detroit mechanical lubricator, Model B, provides lubrication to the steam pipes, engine cylinders, front truck bearings, crosshead guides, steam cylinders of the air compressors and the hot-water pump. Other special equipment includes a Nathan low-water alarm and a Franklin radial buffer between the engine and tender. Superheated steam is used for the blower, all other auxiliaries are operated by saturated steam.

The tender is of the rectangular type mounted on a cast-steel water-bottom frame and has a capacity for 22,000 gal. of water and 22 tons of coal. The loaded weight of the tender is 361,370 lb. and the light weight 136,100 lb. It is carried on Buckeye six-wheel trucks with 33-in. wheels and 6½-in. by 12-in. axle journals. The tender trucks have a wheel base of 10 ft. and are spaced on 22 ft. 9 in. truck centers.

Cause of Fire on Santa Fe Diesel Locomotive

A Diesel-electric locomotive, a description of which was given in the *Railway Mechanical Engineer,* December, 1935, was delivered to the Atchison, Topeka & Santa Fe in October, 1935. This locomotive was made up of two identical sections, each of which contained two power units of 900 hp., and provided with an operating cab at each end, control being of the multiple-unit type.

During a westbound test run on November 20 from Chicago to Los Angeles with a special train of eight cars of standard passenger-train equipment, a fire broke out in the engine compartment of the forward unit. Shortly before the accident the train had stopped at Gallup, N.M., to change crews, at which time the forward engine in the front unit had been cut out on account of a scored cylinder. The fire was discovered about seven miles west of the station, at which time the train was running about 70 m.p.h. on a 0.5 per cent descending grade. The train stopped approximately one mile from the point of the application of the brakes. As soon as possible after stopping the first unit of the locomotive was uncoupled, and the train backed away from the burning unit. The fire was ultimately extinguished by the discharge from a blow-off cock of a steam locomotive placed alongside the blazing unit on an adjacent track. Ne one was seriously injured, but the fire, which was intense while it lasted, did extensive damage to machinery and equipment.

The forward unit was held at Gallup four days for preliminary examination, but no parts were removed or disassembled. The superstructure was then sealed and this unit hauled by the second unit to the shop of the Electro-Motive Corporation, LaGrange, Ill., where a joint detailed examination was made by representatives of the A.T.&S.F., the engine builder and the I.C.C. Bureau of Locomotive Inspection.

The formal report of the Bureau of Locomotive Inspection contains a description of the locomotive, an account of the accident, the examination after the accident, and the results of the final examination. It is from this report that the facts given herewith are taken.

The following brief description of the locomotive and

its equipment will aid in an understanding of what occurred. Each unit, with operating cabs at each end, contains a central engine room separated from the cabs by bulkheads, each having two swinging doors. The engine room contains two 900-hp. Diesel-electric power plants.

Two belt-driven fans for drawing air into the engine room through openings at each end above the operator's cab are located over each power plant. The cooling water radiators are hung from the engine room roof on both sides of and parallel to the exhaust-manifold well, and after passing through the radiators the air flows out through a series of vents into the exhaust manifold well, which forms a trough along the longitudinal center line of the roof.

An auxiliary 90-hp. Diesel engine and heating boiler are located in the center portion of the engine room between the two main power plants. The Diesel engine is direct connected to a generator used for charging the storage batteries, and belt connected to an air compressor and a traction motor blower fan which draws air from the outside and delivers it to the traction motors.

The fuel oil is carried in two 400-gal. tanks connected to a common sump and mounted underneath the bed of the locomotive unit. Filling holes for these tanks are provided in the outer walls to permit filling from the outside and they are equipped with safety plugs designed to prevent flame from entering the tank and to relieve any pressure therein. Each fuel tank is provided with one 1-in. and one 2-in. vent pipe. The 1-in. pipes extend through the bottom of the exhaust-manifold well and terminate in return bends just below the level of the roof. The 2-in. vent pipes extend to approximately the same height and terminate in return bends near the vertical wall of the exhaust-manifold well and inside of the engine room. Any discharge from the 2-in. vent pipes would pass downward through the radiator and into the engine room.

At the time wayside filling stations had not yet been established and each engine unit was temporarily equipped with a rotary refueling pump driven by a chain from the end of the shaft of the air compressor. A jaw clutch, mounted close to the compressor and moved in or out by a lever, permitted the refueling pump to be operated when desired. A pin passing through the lever was provided to hold the clutch disengaged. The inlet pipe to the pump was provided with a gate valve and a connection so that a hose could be passed through a window and coupled to a tank car or wayside tank and oil pumped into the fuel tanks on the locomotive. For the test run a reserve supply of fuel oil was carried in two tanks in a baggage car of the train which were connected to a steel armored hose which extended through the two locomotive units and was connected to the refueling pump in each unit.

The tanks in the baggage car were refilled at Albuquerque, 160 miles east of Gallup, and then contained 3,385 gal. of oil. Refueling of the rear engine unit was completed shortly before reaching Gallup and the tanks on the front unit would then have been refilled had not the operation been delayed by the stop. Upon leaving the station the fireman and the attendant whose duty it was to operate the refueling pumps were called upon to transfer lubricating oil from the rear to the front engine unit. While this work was being performed the fire occurred.

The examination after the fire had been extinguished disclosed the fact that the pin which should have been in the lever operating the clutch driving the refueling pump on the front engine unit was missing and the clutch was partly engaged, also that the gate valve to the pump which should have been closed was more than half open. This permitted the pump to operate and, after the fuel tanks had been filled, the surplus escaped through the vent pipes—part of it dripping onto the engine-room floor and part of it being caught and broken up into a fine spray by the blast from the ventilating fans of the rear power unit which delivered 50,000 cu.ft. of free air per min. at full engine speed. An examination of the track showed that there was oil on the roadway and rails for approximately four miles back from the point where the train stopped, and the condition of the rails indicated that the wheels had been sliding for about three quarters of a mile. It was later found that twenty pairs of wheels on the train were slid flat. This indicated that the refueling pump must have gone into operation soon after the train left Gallup. The wastage was estimated at 350 gallons.

The report closed with the following conclusions:

(1) The direct cause of the accident was improperly located outlets to the vent pipes which discharged the overflow from the fuel-oil tanks into the engine room.

(2) The oil tanks were overflowed, in the absence of an attendant, by oil from a hose line extending from tanks in a baggage car to a refueling pump in the engine room of the unit. Manually operated stop valves in the hose line, at the tanks in the baggage car and at the refueling pump inlet were found in open position. The jaws of the clutch mounted on one end of the air-compressor shaft that drove the refueling pump, which was used for transferring oil through the hose line to the fuel tanks of the unit, were found engaged and the pin provided to hold the clutch handle in off position was not in place. The cause, or causes, for engagement of the clutch and the manually operated stop valve at the inlet of the refueling pump being opened could not be determined. The stop valve at the tanks in the baggage car had been left open by the attendant after completion of refueling of Unit 1-B, as he had anticipated refueling Unit 1-A immediately thereafter, but this operation was interfered with by the stop the train made at Gallup and by being called upon to perform other work when leaving Gallup.

(3) The presence of this refueling arrangement on the unit was a violation of Rule 256 of the Rules and Instructions for Inspection and Testing of Locomotives Other than Steam, which reads: "Fuel reservoirs shall be arranged so they can be filled only from outside of the cab or other compartments."

(4) The fuel oil that was discharged into the engine room from the vicinity of the roof was mixed with air by a strong blast from the cooling and ventilating fans driven from the rear main engine and formed a readily combustible mixture. The exact cause of ignition was not determined, but a number of theories were advanced as to the possible causes, among which are the following: Mixture being blown against the hot exhaust stack of the auxiliary engine, the smokestack of the heating boiler, the hot casting on top of the heating boiler, or drawn through the slotted openings into the boiler fans and thence blown against the red-hot cover of the combustion chamber of the heating boiler; sparking at commutators of heating-boiler motors or auxiliary generator; sparking at storage-battery connections, temporary connection having been made across three front cells by clips and loose wiring which were found on top of the batteries after the fire; sparks from the brake shoes at the time the running test of the brakes was made leaving Gallup.

While there was normally considerable oil scattered on the trucks, piping and fuel tanks, those who participated in the investigation were generally of the opinion that the source of the fire was within the engine room, rather than external.

Passenger Cars Air-Conditioned During 1935*

Railroad	No. of Cars	Type of Cars	Date Equipped	Type of System	Manufacturer of System	Compressor Drive	Refrigerant	Generators: No.	Generators: Capacity Kw.	Generators: Type of Drive	Generators: Type of Mounting	Storage Batteries: Make	Storage Batteries: Ampere-hour Capacity	Outside Power Supply: a. c. or d. c.	Outside Power Supply: Phase	Outside Power Supply: Cycles	Outside Power Supply: Volts
Alton	5	Cafe-Club	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body	Exide, Edison, U. S. L. & K. W.	1,000	d. c.	..	..	32
	2	Pass.-Mail	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
A. T. & S. F.	4	Diners	1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-2 1-4	Flat belt	Truck	Exide	640-850	....	..	..	...
	1	Cafe-obs.	1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Truck	Exide	640-850	....	..	..	...
	8	Coach-club	1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-2 1-4	Flat belt	Truck	Exide	640-850	....	..	..	...
	2	Cafe-lounge	1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Truck	Exide	640-850	....	..	..	...
	54	Chair	1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-2 1-4	Flat belt	Truck	Exide	640-850	....	..	..	...
	4	Parlor	1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-2 1-4	Flat belt	Truck	Exide	640-850	....	..	..	...
	4	Parlor-club	1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-2 1-4	Flat belt	Truck	Exide	640-850	....	..	..	...
A. C. L.	12	Coaches	1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Edison	600	....	..	..	...
	3	Coaches	6-1935	Mech.	Safety C. H. & L.	......	Freon	1	20	V-belt-gear	Body	2 Edison, 1 Exide	1,000	....	..	..	...
B. & O.	29	Coaches	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body	Exide Gould Edison K. W. U. S. L.	1,000	d. c.	..	..	32
	9	Comb.	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
	5	Cafe-club	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
	4	Club-bagg.	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
	7	Cafe-parlor	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
	1	Business	1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt-gear	Body		1,000	d. c.	..	..	32
	1	Comb.[1]	1935	Mech.	B. & O.—York	Motor	Freon	1	6	Driven by main engine	......	Exide	600	d. c.	..	..	32
	2	Coach[1]	1935	Mech.	B. & O.—York	Motor	Freon	1	6	Flat belt	Body	Exide	600	d. c.	..	..	32
	5	Coaches[2]	1935	Mech.	B. & O.—York	Motor	Freon	2	6	Flat belt	Body	Edison	1,000	d. c.	..	..	32
	2	Diners[2]	1935	Mech.	B. & O.—York	Motor	Freon	2	6	Flat belt	Body	Edison	1,000	d. c.	..	..	32
	4	Chair[2]	1935	Mech.	B. & O.—York	Motor	Freon	2	6	Flat belt	Body	Edison	1,000	d. c.	..	..	32
	2	Obs.-chair[2]	1935	Mech.	B. & O.—York	Motor	Freon	2	6	Flat belt	Body	Edison	1,000	d. c.	..	..	32
	1	Buffet-lounge[2]	1935	Mech.	B. & O.—York	Motor	Freon	2	6	Flat belt	Body	Edison	1,000	d. c.	..	..	32
B. & M.	3	Coaches[3]	1935	Mech.	Frigidaire	Motor	Freon	1	32	V-belt	Part of Power plant	None	....	....	..	..	...
	10	Coaches	1935	Mech.	G. E.—Sturtevant	Motor	Freon	1	20	Gear	Truck	Exide	500 at 64 v.	....	..	..	...
C. of Ga.	2	Buffet-lge.-coach	6-1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	Flat belt	Body	Edison	600 two sets	....	..	..	...
	2	Lounge-coach	8-1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	Flat belt	Body	Exide	750	....	..	..	...
C. & O.	2	Business	1934	Mech.	P. C. & M. C.	Speed reducer and motor	Freon	2	4	Flat and V-belt	Body	Exide	500	a. c.	3	60	220
	1	Business	4-1935	Mech.	P. S. C. M. C.-Frigidaire	Speed reducer and motor	Freon	2	4	Flat and V-belt	Body	Exide	500	a. c.	3	60	220
	14	Salon-coach	5-1935	Mech.	P. S. C. M. C.-Frigidaire	Speed reducer and motor	Freon	1	4	Flat belt	Body	Exide	350	a. c.	3	60	220
	2	Diners	4-1935	Mech.	P. S. C. M. C.-Frigidaire	Speed reducer and motor	Freon	1	4	Flat belt	Body	Exide	500	a. c.	3	60	220
C. & E. I.	2	Diners	4-1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-5 1-4	Flat belt	Body	Edison	852	....	..	..	...
	1	Cafe-lounge	6-1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-5 1-3	Flat belt	Body	U. S. L.	1,000	....	..	..	...
	1	Cafe-lounge	6-1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Gould	850	....	..	..	...
C. M. St. P. & P.	4	Diners	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32
	14	Tour.-sleepers	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32
	6	Parlor	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32
	2	Cafe[4]	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32
	4	Parlor[4]	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32
	38	Coaches[4]	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Truck	Exide	850	d. c.	..	..	32

*This tabulation includes cars placed in service during 1934 which were not reported in table published in December, 1934 *Railway Mechanical Engineer.*

*This tabulation includes cars placed in service during 1934 which were not reported in table published in December, 1934 *Railway Mechanical Engineer.*

Passenger Cars Air-Conditioned During 1935 (Continued)

Railroad	No. of Cars	Type of Cars	Date Equipped	Type of System	Manufacturer of System	Compressor Drive	Refrigerant	Generators No.	Generators Capacity Kw.	Generators Type of Drive	Generators Type of Mounting	Storage Batteries Make	Storage Batteries Ampere-hour Capacity	Outside Power Supply a. c. or d. c.	Outside Power Supply Phase	Outside Power Supply Cycles	Outside Power Supply Volts
C. B. & Q.	2	Chair	6-1935	Ice	C. B. & Q.-Trane	......	Ice	1	5	Gear	Body	......	500	....	..	..	...
	16	Chair	6-1935	Mech.	Trane	Motor	Freon	1	20	V-belt-gear	Body	......	1,000	a. c.	3	60	220
	10	Chair	6-1935	Ice	C. B. & Q.-Trane	......	Ice	1	3 or 4	Flat belt	Body	......	500	....	..	..	...
	10	Diners	6-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt	Truck	......	1,000	a. c.	3	60	220
	2	Coaches	6-1935	Mech.	Frigidaire	Motor	Freon	2	1-15	V-belt-gear	Body	......	1,000	a. c.	3	60	220
									1-4	Flat belt							
	3	Coaches	6-1935	Ice	C. B. & Q.-Trane	......	Ice	1	3 or 4	Flat belt	Body	......	500	....	..	..	...
	4	Coaches	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4 or 5	Flat belt	Body	......	500	a. c.	3	60	220
	2	Coaches	6-1935	Ice	C. B. & Q.-Trane	......	Ice	1	4	Flat belt	Body	......	500	....	..	..	...
	2	Coaches	6-1935	Mech.	Frigidaire	Motor	Freon	1	15	Gear	Body	......	1,000	a. c.	3	60	220
	6	Coaches	6-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	......	1,000	a. c.	3	60	220
	1	Coach[5]	1935	Mech.	York	Motor	Freon	1	15	V-belt	Body	......	....	a. c.	3	60	220
	2	Coaches[6]	1935	Mech.	General Electric	Motor	Freon	1[6]	32	V-belt from main engine	......	......	450 at 64 v.	a. c.	3	60	220
	2	Lounge[6]	1935	Mech.	General Electric	Motor	Freon	1[6]	32		......	......	450 at 64 v.	a. c.	3	60	220
	1	Coach[6]	10-1935	Mech.	Frigidaire	Motor	Freon	1[6]	32		......	......	450 at 64 v.	a. c.	3	60	220
	1	Lounge[6]	10-1935	Mech.	Frigidaire	Motor	Freon	1[6]	32		......	......	450 at 64 v.	a. c.	3	60	220
C. & N. W.	11	Coaches	1935	Mech.	Waukesha	Motor	Methyl-chloride	1	15	V-belt-gear	Body	Edison	800	....	..	..	...
	1	Coach	6-1935	Mech.	R. R. Co.	Gas-engine	Freon	..	....	....	......	......	....	....	..	..	...
	1	Cafe-lounge	5-1935	Mech.	Waukesha	Motor	Methyl-chloride	1	15	V-belt-gear	Body	Edison	800	....	..	..	...
	2	Coaches	4-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	10	Comb.	1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	2	Lounge-coach	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	6	Coaches	4-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	26	Coaches	6-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	1	Parlor	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	2	Parlor-obs.	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	8	Parlor	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
C. St. P. M. & O.		Cafe-lounge	4-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	5	Diners	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	2	Cafe-lounge	4-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	2	Lounge-coaches	1-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
	2	Coaches	5-1935	Ice	R. R. Co.	......	Ice	..	....	....	......	......	....	....	..	..	...
C. R. I. & P.	8	Chair	6-1935	Ice	A. C. & F.	......	Ice	1	16-2.6	Flat belt	Body	......	450	....	..	..	...
	7	Parlor	6-1935	Ice	A. C. & F.	......	Ice	1	11-4.0		Body	......	450	....	..	..	...
	6	Cafe-lounge	6-1935	Ice	A. C. & F.	......	Ice	1			Body	......	450	....	..	..	...
	6	Diners	6-1935	Ice	A. C. & F.	......	Ice	1			Body	......	450	....	..	..	...
D. & H.	1	Parlor-cafe	6-1935	Ice	Airtrol-Rails Co.	......	Ice	..	....	....	......	Exide	400	....	..	..	...
D. L. & W.	1	Business	1-1934	Ice	Pullman	......	Ice	1	4	Flat belt	Body	Lead	500	....	..	..	...
	10	Coaches	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Lead	300	a. c.	3	60	220
	1	Buffet-lounge	8-1935	Ice	Safety C. H. & L.	......	Ice	1	4	Flat belt	Body	Lead	300	....	..	..	...
D. & R. G. W.	16	Coaches	5-1935	Ice	Trane Co.	......	Ice	1	3.5	Flat belt	Truck	Edison	340	....	..	..	...
	4	Diner-lounge	5-1935	Ice	Trane Co.	......	Ice	1	4	Flat belt	Body	Edison	520	....	..	..	...
Erie	1	Parlor-coach	7-1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Edison	675	....	..	..	...
F. E. C.	3	Diners	7-1935	St. ejec.	Safety C. H. & L.	......	Water	2	3 and 5	Flat belt	Body	Edison	750	....	..	..	...
	8	Coaches	7-1935	St. ejec.	Safety C. H. & L.	......	Water	2	3 and 4	Flat belt	Body	Edison	600	....	..	..	...
Ft. W. & D. C.	6	Coaches	5-1935	Mech.	Frigidaire	Motor	Freon	2	1-15	V-belt-gear	Body	Lead	1,000	a.		60	220
									1-4	Flat belt	Body						
	1	Diner	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt	Truck	Lead	1,000			60	220
	4	Coaches	5-1935	Mech.	Frigidaire	Motor	Freon	2	1-15	V-belt-gear	Body	Lead	1,000	a.		60	220
									1-4	Flat belt	Body						
	3	Diners	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt	Truck	Lead	1,000	a. c.		60	220
Great Northern	12	Coaches	5-1935	Ice	R. R. Co.	......	Ice	1	4	V-belt	Body	Exide	600	....	..	..	...
	4	Diners	7-1935	Ice	R. R. Co.	......	Ice	1	4	V-belt	Body	Exide	600	....	..	..	...
G. M. & N.	1	Coach[7]	7-1935	Mech.	A. C. F.-York	Motor	Freon	1[7]	80	Driven from main engine	......	......	69	a. c.	3	60	220
	2	Sleeper-obs.[7]	7-1935	Mech.	A. C. F.-York	Motor	Freon	1[7]	80		......	......	69	a. c.	3	60	220
	2	Buffet-coach[7]	7-1935	Mech.	A. C. F.-York	Motor	Freon	1[7]	80		......	......	....	a. c.	3	60	220

Passenger Cars Air-Conditioned During 1935 (Continued)

Railroad	No. of Cars	Type of Cars	Date Equipped	Type of System	Manufacturer of System	Compressor Drive	Refrigerant	Generator No.	Generator Capacity Kw.	Generator Type of Drive	Generator Type of Mounting	Storage Batteries Make	Storage Batteries Ampere-hour Capacity	Outside Power Supply a.c. or d. c.	Phase	Cycles	Volts
Ill. Cent.	1	Business	1934	Ice	A. C. & F.	......	Ice	..	....	....	......	Edison	900	....	..	..	...
	2	Comb.	1935	Ice	A. C. & F.	......	Ice	..	....	....	......	Edison	450	....	..	..	...
	3	Cafe-lounge	1935	Ice	A. C. & F.	......	Ice	..	....	....	......	2 Lead 1 Edison	800 600	....	..	..	...
	2	Cafe-coaches	1935	Ice	A. C. & F.	......	Ice	..	....	....	......	Lead	770	....	..	..	...
	2	Buffet-lounge	1935	Ice	A. C. & F.	......	Ice	..	....	....	......	Edison	750	....	..	..	...
	1	Cafe-lounge	12-1935	Mech.	Waukesha	Gas-engine	Freon	..	....	....	......	Edison	375	....	..	..	...
	5	Comb.		Mech.		Speed reducer	Freon	..	....	....	......	1 Edison 2 Edison 2 Lead	450 375 400	a. c.	3	60	220
	2	Coaches	24-1934	Mech.	24-P. C. & M. C.	Speed-reducer	Freon	..	....	....	......	Lead	400	a. c.	3	60	220
	2	Parlor	9-1935	Mech.	9-P. S. C. M. C.	Speed-reducer	Freon	..	....	....	......	Lead	800	a. c.	3	60	220
	6	Buffet-lounge		Mech.		Speed-reducer	Freon	..	....	....	......	Lead	800	a. c.	3	60	220
	18	Diners		Mech.		Speed-reducer	Freon	..	....	....	......	3 Edison 1 Edison 12 Lead 2 Lead	375 450 800 1,000	a. c.	3	60	220
Lehigh Val.	3	Club	8-1934	Mech.	York	Motor	Freon	2	1-10 1-5	Flat belt	Body	Exide	1,000	a. c.	3	60	220
	3	Diners	7-1934	Mech.	A. C. & F.	Motor	Freon	2	1-10 1-5	V-belt-gear	Body	Exide	1,000	a. c.	3	60	220
	1	Club-diner	8-1934	Mech.	General Electric	Motor	Freon	1	20	Gear	Truck	Exide	1,000	a. c.	3	60	220
	1	Club-diner	9-1934	Mech.	Westinghouse	Motor	Freon	1	15	Gear	Truck	Exide	1,000	a. c.	3	60	220
	4	Coaches	6-1935	Mech.	Frigidaire	Motor	Freon	1	15	2-V-belt-gear 2-Gear	Body	Exide	1,175	a. c.	3	60	220
L. & N.	5	Diners	6-1935	St. ejec.	Safety C. H. & L.	......	Water	1	7.5	Flat belt	Body	Exide	850	....	..	..	...
M.-K.-T.	2	Diners	7-1935	St. ejec.	Safety C. H. & L.	......	Water	2	1-4 1-5	Flat belt	Body	U. S. L.	1,000	....	..	..	...
	3	Chair	7-1935	Ice	R. R. Co.	......	Ice	2	3	Flat belt	Body	Edison	600	....	..	..	...
Mo. Pac.	9	Lounge-diners	1934	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	375	....	..	..	...
	1	Lounge-diner	1934	Mech.	West.-Frigidaire	Motor	Freon	1	20	V-belt-gear	Body	Edison	950	a. c.	3	60	220
	7	Lounge-diner	6-1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	375	....	..	..	...
	16	Chair	6-1935	Ice	R. R. Co.	......	Ice	1	6-4 10-3	Flat belt	Body	Edison	7-600 9-375	....	..	..	...
	45	Coaches	6-1935	Ice	R. R. Co.	......	Ice	1	24-4 21-3	Flat belt	Body	Edison	11-600 34-375	....	..	..	...
	8	Comb.	4-1935	Ice	R. R. Co.	......	Ice	1	3	Flat belt	Body	Edison	375	....	..	..	...
	1	Business	7-1935	Ice	R. R. Co.	......	Ice	2	4	Flat belt	Body	Edison	900	....	..	..	...
	7	Coaches	6-1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Edison	750	....	..	..	...
	5	Chair	6-1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Edison	750	....	..	..	...
	4	Diners	6-1934	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt-gear	Body	Edison	600	....	..	..	...
	5	Lounge-diners	1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Edison	750	....	..	..	...
	3	Lounge-diners	6-1935	Mech.	Frigidaire	Motor	Freon	1	20	V-belt-gear	Body	Edison	950	a. c.	3	60	220
N. Y. C. System	1	Coach	9-1934	Mech.	General Electric	Motor	Freon	1	20	Gear	Truck	U. S. L.	450 at 64 v.	....	..	..	...
	46	Coaches	5-1935	Mech.	Frigidaire	Motor	Freon	1	20	Gear	Truck	Exide, Gould, K. W. and U. S. L.	600 at 64 v.	....	..	..	...
	11	Diners	6-1935	Mech.	Airtemp.	Motor	Freon	1	20	Gear	Truck	Exide	600 at 64 v.	....	..	..	...
N. Y. C. & St. L. (NKP)	2	Coaches	9-1934	Mech.	P. C. & M. C.	Speed reducer	Freon	1	4	V-belt	Body	Exide	286	a. c.	3	60	220
	1	Coach	5-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4	V-belt	Body	Exide	286	a. c.	3	60	220
N. Y. N. H. & H.	1	Club	8-1934	Ice	R. R. Co.-Rails Co.	......	Ice	..	....	....	......	Exide	300	....	..	..	...
	4	Smokers	7-1934	Mech.	Safety C. H. & L.	Motor	Freon	1	15	V-belt-gear	Body	Exide	1,000	....	..	..	...
	20	Coaches	6-1934	Mech.	Safety C. H. & L.	Motor	Freon	1	15	V-belt-gear	Body	Exide	1,000	....	..	..	...
	3	Comb.	7-1934	Mech.	Safety C. H. & L.	Motor	Freon	1	15	V-belt-gear	Body	Exide	1,000	....	..	..	...
	4	Diners	6-1934	Ice	R. R. Co.-Sturtevant	......	Ice	..	....	....	......	Exide	600	....	..	..	...
	50	L.-w. Coaches	1-1935	Mech.	G. E.-Sturtevant	Motor	Freon	1	20	Gear	Truck	40 Exide 5 Willard	500 at 64 v.	....	..	..	...
	3	Coaches[8]	5-1935	Mech.	Westinghouse	Motor	Freon	2[8]	....	Driven by main engine	......	Exide	110 volts	....	..	..	...
	35	Coaches	6-1935	Ice	R. R. Co.-Sturtevant	......	Ice	..	....	....	......	Exide	432	....	..	..	...
	1	Club	7-1935	Ice	R. R. Co.-Sturtevant	......	Ice	..	....	....	......	Exide	300	....	..	..	...
	10	Smokers	7-1935	Mech.	Safety C. H. & L.	Motor	Freon	1	15	V-belt-gear	Body	Exide	1,000	....	..	..	...
	10	Coaches	7-1935	Ice	R. R. Co.-Sturtevant	......	Ice	..	....	....	......	Exide	432	....	..	..	...
	2	Diners	7-1935	Ice	R. R. Co.-Sturtevant	......	Ice	..	....	....	......	Exide	432	....	..	..	...
	3	Comb.	7-1935	Ice	R. R. Co.-Safety C. H & L.	......	Ice	..	....	....	......	Exide	432	....	..	..	...

Passenger Cars Air-Conditioned During 1935 (Continued)

								Generators				Storage Batteries		Outside Power Supply			
Railroad	No. of Cars	Type of Cars	Date Equipped	Type of System	Manufacturer of System	Compressor Drive	Refrigerant	No	Capacity Kw.	Type of Drive	Type of Mounting	Make	Ampere-hour Capacity	a. c. or d. c.	Phase	Cycles	Volts
Nor. & Wn.	4	Coaches	1-1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	Flat belt	Body	Edison	225 at 110 v.	....	..	..	...
	8	Comb.	2-1935	Mech.	West.-Sturtevant	Motor	Freon	1	15	V-belt-gear	Body	Edison	300 at 110 v.	a. c.	3	60	220
	6	Coaches	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	Exide	300 at 110 v.	a. c.	3	60	220
	12	Coaches	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	Edison	300 at 110 v.	a. c.	3	60	220
	1	Diner	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	Gear	Body	Edison	300 at 110 v.	a. c.	3	60	220
	3	Diners	5-1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	Edison	300 at 110 v.	a. c.	3	60	220
Nor. Pac.	6	Diners	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4	Flat belt	Body	Exide	200	a. c.	3	60	220
	4	Obs.	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4	Flat belt	Body	Gould	600	a. c.	3	60	220
	2	Coaches	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4	Flat belt	Body	Exide	350	a. c.	3	60	220
	10	Coaches	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	4	Flat belt	Body	5 Exide 5 Gould	500	a. c.	3	60	220
	4	Coaches	6-1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	5	Flat belt	Body	3 Gould 1 Exide	500	a. c.	3	60	220
Pennsylvania	44	Coaches	1935	Ice	R. R. Co.	......	Ice	1	4.8	Flat belt	Body	......	500	....	..	..	...
	6	Comb.	1935	Ice	R. R. Co.	......	Ice	1	4.8	Flat belt	Body	......	500	....	..	..	...
	20	Comb.	1935	Ice	R. R. Co.	......	Ice	1	4.8	Flat belt	Body	......	500	....	..	..	...
	2	M. U. coaches	1935	Mech.	General Electric	Motor	Freon	..	....	....	......	......	....	a. c.	3	60	220
	1	M. U. coach	1935	Mech.	Frigidaire	Motor	Freon	..	....	....	......	......	....	a. c.	3	60	220
	3	Diners	1935	Mech.	Airtemp.	Motor	Freon	1	15	V-belt-gear	Body	......	800	....	..	..	...
	2	Diners	1935	Mech.	Safety C. H. & L.	Motor	Freon	1	15	V-belt-gear	Body	......	800	....	..	..	...
	11	Diners	1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	......	800	....	..	..	...
	3	Lounge-diners	1935	Mech.	Frigidaire	Motor	Freon	1	15	V-belt-gear	Body	......	800	....	..	..	...
	1	Coach	1935	Mech.	Baldwin-Southwark	Motor	Freon	1	20	V-belt-gear	Body	......	800	....	..	..	...
Pullman	8	Parlor and parlor obs.		Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt and gear	Body	Exide, Gould, K. W. and U. S. L.	1,000	....	..	..	...
	56	Composite		Ice	Pullman	......	Ice	1	4	V-belt	Body	Exide	600	....	..	..	...
	139	Composite		Mech.	P. S. C. M. C.	Motor	Freon	2	1-4 1-15	V-belt V-belt and gear	Body	Exide	1,000	....	..	..	...
	13	Composite	1934 and 1935	Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	Flat belt Flat belt and gear	Body	Exide, Gould, K. W. and U. S. L.	1,000	....	..	..	...
	54	Composite		St. ejec.	Safety C. H. & L.	......	Water	2	4	V-belt	Body	Exide	850	....	..	..	...
	377	Sleepers		Ice	Pullman	......	Ice	1	4	V-belt	Body	Exide	600	....	..	..	...
	882	Sleepers		Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	V-belt	Body	Exide	1,000	....	..	..	...
	200	Sleepers		St. ejec.	Safety C. H. & L.	......	Water	2	4	V-belt	Body	Exide	850	....	..	..	...
	99	Sleepers		Mech.	B. & O.—York	Motor	Freon	2	1-4 1-7½	V-belt V-belt and gear	Body	Exide, Gould, K. W. and U. S. L.	1,000	....	..	..	...
Reading	12	Coaches	1935	Mech.	York	Motor	Freon	2	1-4 1-7½	Flat belt	Body	8 Exide 4 Edison	1,000	a. c.	3	60	220
	5	Comb.	1935	Mech.	York	Motor	Freon	2	1-4 1-7½	Flat belt	Body	Exide	1,000	a. c.	3	60	220
	4	Cafe	1935	Mech.	York	Motor	Freon	2	1-4 1-7½	Flat belt	Body	Exide	1,000	a. c.	3	60	220
C. R. R. of N. J.	7	Coaches	1935	Mech.	York	Motor	Freon	2	1-3 1-7½	Flat belt	Truck	4 Exide 3 U. S. L.	1,000	a. c.	3	60	220
	2	Club-coaches	1935	Mech.	York	Motor	Freon	1	3	Flat belt	Truck	Exide	300	a. c.	3	60	220
	1	Club-coach	1935	Mech.	York	Motor	Freon	..	....	....	......	Exide	300	a. c.	3	60	220
	3	Cafe	1935	Mech.	York	Motor	Freon	2	1-4 1-7½	Flat belt	Body	1 Exide 2 U. S. L.	1,000	a. c.	3	60	220
R. F. & P.	2	Comb.	1935	Mech.	Frigidaire-Safety C. H. & L.	Motor	Freon	1	10	V-belt-gear	Body	Edison	300	a. c.	3	60	220
	3	Coaches	1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Edison	300	a. c.	3	60	220
	3	Coaches	1935	Mech.	Safety C. H. & L.	Motor	Freon	1	20	V-belt-gear	Body	2 Edison 1 Exide	1,000	....	..	..	...
	2	Coaches	1935	Mech.	Frigidaire-Safety C. H. & L.	Motor	Freon	1	20	V-belt-gear	Body	Edison	300	a. c.	3	60	220
St. L.-S. F.	2	Diners	1935	Ice	R. R. Co.	......	Ice	1	4	V-belt	Body	Exide	450	....	..	..	...
	4	Chair	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Exide	450	....	..	..	...
	8	Chair	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	U. S. L., Gould, Exide	450 or 500	....	..	..	...
	15	Coaches	1935	Ice	R. R. Co.	......	Ice	1	3 or 4	Flat belt	Body	Exide, K. W., U. S. L.	450 or 500	....	..	..	...
	5	Diners	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	U. S. L., Exide	450 or 500	....	..	..	...
	2	Coach-sleepers	1935	Ice	R. R. Co.	......	Ice	2	1-3 1-4	Flat belt	Body	Exide	900	....	..	..	...
	2	Comb.	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Exide	450	....	..	..	...
	2	Business	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Exide	900	a. c.[9]	3	60	220

Passenger Cars Air-Conditioned During 1935 (Continued)

Railroad	No. of Cars	Type of Cars	Date Equipped	Type of System	Manufacturer of System	Compressor Drive	Refrigerant	Generators: No.	Generators: Capacity Kw.	Generators: Type of Drive	Generators: Type of Mounting	Storage Batteries: Make	Storage Batteries: Ampere-hour Capacity	Outside Power Supply: a. c or d. c.	Outside Power Supply: Phase	Outside Power Supply: Cycles	Outside Power Supply: Volts
Seaboard Air Line	10	Coaches	10–1934	Mech.	P. C. & M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Edison	300	a. c.	3	60	220
	8	Comb.	10–1934	Mech.	P. C. & M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Edison	300	a. c.	3	60	220
	6	Diners	10–1934	Mech.	P. C. & M. C.	Speed reducer	Freon	1	4	Flat belt	Body	Edison	375	a. c.	3	60	220
	4	Coaches	6–1935	Mech.	P. S. C. M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Edison	300	a. c.	3	60	220
	1	Coach	6–1935	Mech.[10]	P. S. C. M. C.	Speed reducer	Freon	1	3	Flat belt	Body	Edison	....	a. c.	3	60	220
	1	Business	7–1935	Mech.	Waukesha-Melcher	Motor	Freon	1	10	V-belt and gear	Body	Edison	900	....	..	..	...
	3	Rail Cars	12–1935	Mech.	A. C. F.	Gas-engine	Freon	..	....	....	......	Exide[11]	....	....	..	..	...
Southern	27	Diners	1935	St. ejec.	Safety C. H. & L.	......	Water	1	7½	Flat belt	Body	Exide	600	....	..	..	...
Southern Pac.	2	Parlor	6–1934	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	600	....	..	..	...
	4	Lounge-obs.	6–1934	Ice	R. R. Co.	......	Ice	1	5	V-belt	Truck	Edison	750	....	..	..	...
	5	Diners	1934	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	450	....	..	..	...
	5	Parlor	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	600	....	..	..	...
	21	Diners	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	450	....	..	..	...
	1	Club	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	375	....	..	..	...
	35	Coaches	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	14–600 8–375 13–300				
	21	Chair	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	12–600 6–375 3–300	....	..	..	...
	4	Cafe-Parlor	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	450				
	8	Chair	7–1935	St. ejec.	Safety C. H. & L.	......	Water	2	1–3 1–5	Flat belt V-belt	Body Truck	Edison	900	....	..	..	...
Texas & Pac.	12	Coaches	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Body	Edison	750	....	..	..	...
	10	Coaches	1935	St. ejec.	Safety C. H. & L.	......	Water	1	10	V-belt	Body	Edison	900	....	..	..	...
	1	Diner	1935	Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	Flat belt	Body	Edison	750	a. c.	3	60	220
	1	Business	1935	Mech.	Westinghouse	Motor	Freon	1	15	V-belt	Body	Edison	1,800	a. c.	3	60	220
	4	Chair	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	375	....	..	..	...
	12	Coaches	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	450	....	..	..	...
	4	Diners	1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	600	....	..	..	...
Union Pacific	21	Chair	5–1935	Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	Flat belt	Body	Edison	300	a. c.	3	60	220
	40	Coaches	5–1935	Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	Flat belt	Body	Edison	300	a. c.	3	60	220
	13	Observation	5–1935	Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	Flat belt	Body	Exide	500	a. c.	3	60	220
	17	Diners	5–1935	Mech.	P. S. C. M. C.	Speed-reducer	Freon	1	4	Flat belt	Body	Exide	500	a. c.	3	60	220
	5	Coaches	5–1935	Mech.	York	Motor	Freon	2	1–15 1–4	V-belt Flat belt	Body	Exide	1,000	a. c.	3	60	220
	10	Coaches	5–1935	Mech.	Gen'l Electric	Motor	Freon	1	20	Flat belt	Body	Exide	1,000	a. c.	3	60	220
	8	Coaches	5–1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Exide	1,000	....	..	..	...
	17	Chair	5–1935	St. ejec.	Safety C. H. & L.	......	Water	2	4	Flat belt	Body	Exide	1,000	....	..	..	...
Wabash	12	Chair	6–1935	Ice	R. R. Co.	......	Ice	1	3	Flat belt	Body	......	500	....	..	..	...
	2	Cafe-Parlor	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	......	500	....	..	..	...
	4	Lounge	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	......	500	....	..	..	...
	2	Buffet-Chair	6–1935	Ice	R. R. Co.	......	Ice	1	4	Flat belt	Body	Edison	500	....	....	..	...
Western Pac.	4	Coaches	6–1935	St. ejec.	Safety C. H. & L.	......	Water	2	1–3 1–4	Flat belt	Body	Edison	600	....	..	..	...

[1](B. & O.) Three-car Diesel motor train.

[2](B. & O.) Light weight trains.

[3](B. & M.) Three-unit articulated Diesel-electric train.

[4](C. M. St. P. & P.) Streamlined cars.

[5](C. B. & Q.) One unit of streamlined train.

[6](C. B. & Q.) Units of streamlined train. One generator and one battery per train.

[7](G. M. & N.) Units of streamlined train. Single 80 kw. auxiliary generator driven by main engine supplies current for train.

[8](N. Y. N. H. & H.) Three-unit streamlined train with two separate air-conditioning units, each serving one-half of train. Power furnished by one auxiliary generator on each of two main power plants.

[9](St. L.-S. F.) Cars are equipped with motor-generator sets for charging batteries.

[10](S. A. L.) Equipped with auxiliary holdover.

[11](S. A. L.) System uses one 6-volt, 86 amp.-hr. battery for starting gasoline engine on Freon compressor. Lighting load carried by 12-V., 1,200 watt generator on main engine and 12-V. battery.

Summary of 1935 Air Conditioned Cars by Types of Cars

Name of Railroad	Total Cars	Coaches (Note A)	Combination (Note B)	Dining (Note C)	Business	Lounge-Diners (Note D)	Chair	Observation (Note E)	Sleeper-Chair	Sleeping Cars (Note F)
Alton	7	..	2	..	..	5	..	..	..	..
A. T. & S. F.	77	8	..	4	..	3	62	..	..	..
A. C. L.	15	15	..	..	..	..	..	..	..	..
B. & O.	72	36	14	2	1	13	4	2	..	..
B. & M.	15	15	..	..	..	..	..	..	..	..
Cen. of Ga.	4	2	..	..	..	2	..	..	..	..
C. & O.	19	14	..	2	3	..	..	..	..	..
C. & E. I.	4	..	..	2	..	2	..	..	..	..
C. M. St. P. & P.	68	38	..	6	..	..	10	..	..	14
C. B. & Q.	64	23	..	10	..	..	31	..	..	..
C. & N. W.	70	48	10	..	..	1	9	2	..	..
C. St. P. M. & O.	13	4	..	5	..	4	..	..	..	..
C. R. I. & P.	27	..	..	6	..	6	15	..	..	..
D. & H.	1	..	..	..	..	1	..	..	..	..
D. L. & W.	12	10	..	..	1	1	..	..	..	..
D. & R. G. W.	20	16	..	..	..	4	..	..	..	..
Erie	1	1	..	..	..	..	..	..	..	..
Fla. E. C.	11	8	..	3	..	..	..	..	..	..
Ft. W. & D. C.	14	10	..	4	..	..	..	..	..	..
Great Northern	16	12	..	4	..	..	..	..	..	..
G. M. & N.	5	1	..	..	..	2	..	..	..	2
Illinois Central	44	2	7	18	1	14	2	..	..	..
Lehigh Valley	12	4	..	3	..	2	3	..	..	..
L. & N.	5	..	..	5	..	..	..	..	..	..
M-K-T	5	..	..	2	..	..	3	..	..	..
Mo. Pac.	111	52	8	4	1	25	21	..	..	..
N. Y. C. System	58	47	..	11	..	..	..	..	..	..
N. Y. C. & St. L.	3	3	..	..	..	..	..	..	..	..
N. Y. N. H. & H.	146	132	6	6	..	..	2	..	..	..
Nor. & Wn.	34	22	8	4	..	..	..	..	..	..
Nor. Pacific	26	16	..	6	..	..	..	4	..	..
Pennsylvania	93	48	26	16	..	3	..	..	..	..
Pullman Co.	1828	..	..	..	..	..	..	8	262	1558
Reading	21	12	5	4	..	..	..	..	..	..
C. R. R. of N. J.	13	10	..	3	..	..	..	..	..	..
R. F. & P.	10	8	2	..	..	..	..	..	..	..
St. L.-S. F.	40	15	2	7	2	..	12	..	2	..
Seaboard A. L.	33	18	8	6	1	..	..	..	..	..
Southern	27	..	..	27	..	..	..	..	..	..
Southern Pacific	106	35	..	26	..	4	37	4	..	..
Texas & Pacific	44	34	..	5	1	..	4	..	..	..
Union Pacific	131	63	..	17	..	..	38	13	..	..
Wabash	20	..	..	..	..	4	16	..	..	..
Western Pacific	4	4	..	..	..	..	..	..	..	..
	3349	786	98	218	11	96	269	33	264	1574

Note A—Includes coach-club and coach-lounge cars.
Note B—Includes passenger-mail, passenger-baggage and club-baggage cars.
Note C—Includes cafe cars.
Note D—Includes cafe-club, cafe-parlor, cafe-lounge, cafe-coach and buffet-lounge cars.
Note E—Includes observation-chair cars.
Note F—Includes tourist-sleepers and sleeper-observation cars.

Summary of Cars by Types of Systems and Refrigerants Used

Name of railroad	No. cars	Type of system				Refrigerant used			
		Electro-mech.	Direct-mech.	Ice	Steam ejector	Freon	Water	Ice	Methyl-chloride
Alton	7	7	..	..	..	7	..	..	..
A. T. & S. F.	77	..	..	..	77	..	77	..	..
A. C. L.	15	3	..	..	12	3	12	..	..
B. & O.	72	72	..	..	..	72	..	..	..
B. & M.	15	15	..	..	..	15	..	..	..
Cen. of Ga.	4	..	..	..	4	..	4	..	..
C. & O.	19	..	19	..	..	19	..	..	..
C. & E. I.	4	..	..	..	4	..	4	..	..
C. M. St. P. & P.	68	..	..	..	68	..	68	..	..
C. B. & Q.	64	43	4	17	..	47	..	17	..
C. & N. W.	70	12	1	57	..	1	..	57	12
C. St. P. M. & O.	13	..	..	13	..	..	..	13	..
C. R. I. & P.	27	..	..	27	..	..	..	27	..
D. & H.	1	..	..	1	..	..	..	1	..
D. L. & W.	12	..	10	2	..	10	..	2	..
D. & R. G. W.	20	..	..	20	..	..	..	20	..
Erie	1	..	..	..	1	..	1	..	..
Fla. E. C.	11	..	..	..	11	..	11	..	..
Ft. W. & D. C.	14	14	..	..	..	14	..	..	..
Great Northern	16	..	..	16	..	..	..	16	..
G. M. & N.	5	5	..	..	..	5	..	..	..
Illinois Central	44	..	34	10	..	34	..	10	..
Lehigh Valley	12	12	..	..	..	12	..	..	..
L. & N.	5	..	..	..	5	..	5	..	..
M-K-T	5	..	..	3	2	..	2	3	..
Mo. Pac.	111	4	..	86	21	4	21	86	..
N. Y. C. System	58	58	..	..	..	58	..	..	..
N. Y. C. & St. L.	3	..	3	..	..	3	..	..	..
N. Y. N. H. & H.	146	90	..	56	..	90	..	56	..
Nor. & Wn.	34	30	..	..	4	30	4	..	..
Nor. Pacific	26	..	26	..	..	26	..	..	..
Pennsylvania	93	23	..	70	..	23	..	70	..
Pullman Co.	1828	259	882	433	254	1141	254	433	..
Reading	21	21	..	..	..	21	..	..	..
C. R. R. of N. J.	13	13	..	..	..	13	..	..	..
R. F. & P.	10	7	3	..	..	10	..	..	..
St. L.-S. F.	40	..	..	40	..	..	..	40	..
Seaboard A. L.	33	1	32	..	..	33	..	..	..
Southern	27	..	..	..	27	..	27	..	..
Southern Pacific	106	..	..	98	8	..	8	98	..
Texas & Pacific	44	1	1	20	22	2	22	20	..
Union Pacific	131	15	91	..	25	106	25	..	..
Wabash	20	..	..	20	..	..	..	20	..
Western Pacific	4	..	..	.	4	..	4	..	..
	3349	705	1106	989	549	1799	549	989	12

EDITORIALS

Is Accuracy Worth-While?

Control over the cost of locomotive repairs involves, first, good locomotive design and, second, the development and adherence to methods of parts production and assembly such as will assure a continuance of standards proved by experience to be worth while. Economy in maintenance demands interchangeability of parts and interchangeability demands accuracy of dimension. It is, therefore, not at all surprising to find the more progressive railroad shops today demanding standards of accuracy that would have been considered impossible of attainment a few years ago. Where one finds low repair costs there is usually found, at the same time, a high standard of accuracy in shop work.

There are still many people, both in and out of the railroad industry who believe that accuracy, in a railroad sense, means "yardstick" measurements and it would prove quite startling to such people to observe methods in some of our shops which involve production to tolerances which are impossible without the use of precision measuring tools.

Because of the rather "rough" nature of a large part of locomotive assembly work it has been a difficult job to educate mechanics to the value of greater accuracy but in those shops where the educational process has taken place it would be just as difficult to change back to the old inaccurate standards. It has been found that no matter how skillfully a good mechanic might use ordinary calipers an average mechanic with micrometers and gages can produce more accurate work. It has also been found that, having become accustomed to the use of precision instruments and producing work to precise dimensions, many mechanics who formerly were satisfied with mediocre work now take pride in producing exceptionally good work.

But, having educated mechanics to work to small tolerances and having provided them with precision measuring instruments, it has also been found that there are many railroad shop machine tools that are not capable of producing accurate work under any circumstances due to the fact that they have long since reached a condition where the wear of parts permits lost motion or has caused misalignment of important units of a machine.

In one shop where, over a period of three or four years, there has been an intensive effort made to produce more accurate parts the introduction of precision measuring instruments provided the first really accurate check they had ever had on the machine tool equipment of the shop and the supervisors were astonished to see how impossible it would be to turn out work to the tolerances now demanded. As job after job was tooled up for production it first became necessary to go all over the machines, line them up and overhaul them. It also resulted, in the case of several machines, in retiring them and replacing them with up-to-date equipment. Now it is possible to get increased production which meets the required standards of precision and at a much reduced cost.

Accuracy of lay-out in the erecting shop and close tolerances in machine work permit interchangeability and thereby make possible quantity production at savings which are an incident thereto. Adherence to standard dimensions broadens the range of use of a given part and thereby reduces stock inventory. The accuracy of workmanship demanded by close tolerances makes it necessary to keep a constant check on the condition of shop equipment and the habit of production to precision measurements has the psychological effect of causing a workman to take pride in better workmanship. All things taken into consideration, accuracy is worthwhile.

The Mechanical Associations

Our readers will recall that a considerable portion of the January number of the *Railway Mechanical Engineer* was given over to messages from the leaders of the mechanical-department associations and to a supporting editorial entitled, "1936 'Forward!' 'March!'"

Comments on these expressions are still coming in. In general, they indicate keen appreciation for the effort that we are making to revive and stimulate the work of the so-called minor mechanical department associations. In a number of instances this commendation was coupled with specific suggestions, particularly relating to the importance of these organizations in educating the officers and supervisors to a better understanding of their problems. This, of course, is particularly important to men who have been promoted to supervisory positions in the past few years, or who may be promoted as business continues to improve.

A few of the letters are critical, in some instances as to details and in other instances as to broader policies. The suggestion is made that possibly a study might indicate that some of the weaker associations can be done away with, while others may be consolidated. The latter suggestion is particularly strong in relation to the Traveling Engineers' Association and the International Railway Fuel Association.

Among the broader criticisms is one to the effect that the members of the minor associations, not understanding fully all of the problems involved in the broader aspects of railroading, sometimes make statements which may be misunderstood and are not in the best interests of the railroads. There may have been

instances of this sort, but in our opinion, from an intimate study of the associations over many years, they have been few and far between and are insignificant as compared to the great good that has been accomplished for the railroads by these organizations.

The railroad cause will never be seriously embarrassed by a free and open discussion of all of the problems involved, and particularly of those concerned with the operation of the technical branches. Since the railroad question has become to so large an extent a public question, we must expect criticism, particularly if any really worthwhile, forward progress is being made. Since it is part of the program we might just as well make up our minds to it, and meet it by adopting a constructive program to educate the public and the employees to the real facts.

One suggestion with which we cannot agree is that the minor mechanical associations be brought directly under the Mechanical Division and become an integral part of it. Frankly, we do not believe that this will be in the best interests of the mechanical departments or of the railroads. The Mechanical Division, as it is now constituted, devotes practically all of its energies to the formulation of standards and recommended practices. It has settled down to a machinery-like process and has lost much of the vigor and sparkle that characterized it when it was on a more voluntary basis and had broader outlook and objectives.

We believe that a very vital part of the work of the minor associations is that of inspiring their members, giving them a larger and broader vision and stimulating them to more intensive efforts. The work of these associations is largely educational and in no sense can be compared with the work of the Mechanical Division or the Association of American Railroads as a whole. It can, however, be made a very vital adjunct to the work of these associations, if they are maintained on a voluntary, independent basis. They can be relied upon to co-operate with the Mechanical Division when the need arises.

Two Things Which Are Not New in 1936

The old adage that "there is nothing new under the sun" is borne out by many experiences and trends in present-day railroading, two of which may be mentioned. The demand for high train speeds, for example, implies motive power designed for this service, one of the requirements being relatively large diameter driving wheels. In recent years, the diameters of steam locomotive driving wheels for both passenger and freight service have been substantially increased, the maximum being 7-ft. wheels such as are on the Milwaukee's "Hiawatha". Driving wheels of this size were by no means uncommon in an earlier day of railroading, however, and it may be surprising to some of our readers to learn that during the period 1860-65 a considerable number of locomotives were placed in service with 8-ft. driving wheels; one, the "Allan Crewe" in England, had 8-ft. 2-in. driving wheels.

Similarly, the current discussion regarding taper tread versus cylindrical tread wheels is no novelty. The following is quoted from the Railroad Gazette of April 16, 1870:

> Every one knows that the outer rail of a railroad track is longer than the inner one, and the coning of the car wheel, or the gradual increase of its diameter of tread toward the flange, is intended to facilitate the motion of the cars around a curve. Thus a fast express train will press more against the outer rail than the inner, and by reason of the increased diameter of the tread near the flange of the outer car wheel, the outer wheel will move further per revolution than the inner one.
>
> This would seem to be an indisputable argument in favor of the coning of car wheels, and it has been so universally the practice on railroads that it seems hardly credible that there should be anything incorrect about it. There are, however, very weighty arguments against the practice. In the case of freight cars, the coning would act injuriously rather than beneficially, because it is against the inner rail that these cars have a tendency to press. But supposing the question is confined to the expediency of coning the car wheels for fast passenger trains only, we find that the coning acts injuriously on the straight portions of the road, the wheels running up against one rail on to the largest diameter of the tread, and then against the opposite rail on to the largest diameter of the tread of the opposite wheel, and so on, first against one rail and then the other, producing an oscillation which is both disagreeable to the passengers and expensive to the stockholders of the road.
>
> Again, of how much value is the coning on curves? It is extremely small. On a railroad like the Hudson River or New York Central, the radius of the curves is very large, one mile being very common—in fact curves of a less radius than this are more seldom met with than curves of a larger radius. The diameter is, of course, twice the radius, and the circumference, or length of a complete circle, three and one-seventh times the diameter; thus a curve with a one-mile radius would be six and two-seventh miles in length. Now, the difference between the circumferences measured on the inner and outer rail is always equal to the circle having as radius the distance between the two rails. Thus, in the case of a broad gage road, whose gage is six feet, the difference between the length of the outer and inner rails is only a trifle over 18 ft. in a complete circle, no matter what the diameter of that circle. In the case of a curve whose radius is one mile, the length is something over six miles, as stated above, and a car wheel in passing over this six miles of curve would have to slip about eighteen feet if it had no coning. A curve on a road is never complete, however. One-sixth of a circle, with radius of one mile, would be an ordinary curve and its length would be one mile, and the difference in the length of the rails about three feet. Hence the question arises, is it not better to use wheels with a flat tread, causing a very little slip on curves, and very little oscillation on the straight portions of the track, rather than coned wheels, whose efficiency is somewhat doubtful on curves, and which cause injurious oscillation on straight portions of the track.
>
> This question must be decided one way or the other, according to the circumstances. For instance, on some roads the straight portions of the track are the exception, and curved portions the rule; hence coned wheels might be considered necessary. On other roads there might be a very few extremely sharp curves, and coned wheels might be necessary here. * * * In conclusion, it is extremely doubtful if the present system of coning is beneficial, and cars with wheels having a

flat tread have been tried and reported favorably on by the superintendent of one of our western railroads.

The Illinois Central has used cylindrical tread wheels on its multiple-unit electric trains with good results for several years. The Chicago, North Shore & Milwaukee has recently standardized on this tread contour which is also being used on numerous light-weight high-speed trains operating in various sections of the country. The indications are that for standard heavy equipment, a smoother operation is secured, all things considered, with taper tread tires, owing to the fact that the weight of the equipment provides substantial components of force tending to hold it central on the track. In the case of light-weight equipment, however, experience indicates that truck nosing and transverse oscillation of the car wheels from rail to rail is substantially reduced by using cylindrical treads.

Light-Weight Passenger Equipment

The first of the light-weight, self-propelled, articulated trains, built about two years ago, were designed with a view to demonstrating the possibilities of weight reduction in passenger equipment for high-speed service by the employment of special materials—the strong alloys of aluminum in the case of the train built for the Union Pacific and high-tensile stainless steel in the case of the Burlington train. In order that the demonstration might be impressive the cross-sections of the body units were reduced in width and height, and flexibility of train consist was completely sacrificed to the interests of weight reduction by the employment of the articulation principle of joining the body units. The two trains, each with three body units, complete with 600-horsepower Diesel-electric power plants, weighed slightly more than 100 tons each, thus providing more than five rated horsepower per ton of total train load. As later trains have been built with more body units the horsepower ratio has declined. In the case of the seven-unit train on the Union Pacific, with a 1,200-horsepower Diesel-electric power plant, there is approximately 4.5 horsepower per ton, and, with the four-unit Mark Twain Zephyr of the Burlington, 4.2 horsepower per ton.

These trains with their high power-weight ratio as compared with heavy main-line steam passenger trains demonstrate impressively what weight reduction and ample power can do in speeding up passenger-train movement and reducing train-mile costs. The lack of flexibility in train make-up, however, presents a serious handicap in fitting such trains successfully into a traffic situation in which improved facilities and higher speeds tend to build up the patronage.

The orders for motor trains recently placed by these same railways mark the evolution of this type of construction from a unit adapted only to a highly specialized situation into railway passenger equipment of full stature in which the flexibility of separate coach units has been restored. The trains with ten revenue body units and separate Diesel-electric locomotives (2,400 horsepower on the Union Pacific, and 3,000 horsepower on the Burlington) will probably retain a horsepower-weight ratio of four or better. The use of the articulation principle has been retained to join bodies into two- and three-unit coaches, thus effecting a considerable saving in truck weight without a complete sacrifice of flexibility.

Both of these trains are destined to operate on schedules much faster than those now prevailing. So long as the consists of the trains are not expanded, they will no doubt maintain these schedules successfully. Should, however, a growing popularity of the service dictate the addition of more cars, more powerful locomotives will have to be used or the necessary margin of power will be sacrificed. Long-distance schedules of over 60 miles an hour can scarcely be maintained with a ratio of three horsepower per ton or less, common in heavy main-line passenger service today.

A significant step in the reduction of the weight of passenger equipment is represented by the stainless-steel coach of the Atchison, Topeka & Santa Fe, a description of which appears elsewhere in this issue. This is not the first coach in which substantial reductions in weight have been effected by the use of new materials. There are the Abraham Lincoln and the Royal Blue trains of the Baltimore & Ohio, and the Rebel trains of the Gulf, Mobile & Northern. The coaches in these trains, however, have been specially fitted so that they are not readily interchangeable with other standard coaches. The Cor-Ten-steel coaches of the New York, New Haven & Hartford and the Boston & Maine and the welded coaches of the Chicago, Milwaukee, St. Paul & Pacific all represent substantial savings in weight of cars intended for operation interchangeably with the older equipment. But the Santa Fe car is the first car intended to be thrown into the trains of heavy standard equipment, in which full advantage has been taken of the possibilities for weight saving developed in the stainless-steel articulated train structure. These and the welded coaches of the Chicago, Milwaukee, St. Paul & Pacific also embody an end formation which has rarely been seen on coaches in America. The straight longitudinal roof lines at the ends are suitable for use with outer diaphragm closures and, even without these, should tend to induce less air turbulence between cars than the present conventional hooded ends.

With the dropping of the clerestory, which is no longer needed with the forced ventilation adopted with air conditioning, some consideration will soon need to be given to the question of a standard sectional contour if for no other reason than to avoid the unsightly appearance which conflicting contours would produce when combined in the same train. There is the further important consideration, however, that the ultimate use of outer diaphragms will be seriously retarded unless a standard contour is adopted.

THE READER'S PAGE

Pound Foolish

To the Editor:

Your December number has a story called "Pound Foolish." Although fiction, it is true to every-day happenings.

Of course we all know that the mechanical department carries the biggest load, and that if the stores department would keep up with it, things would run a lot more smoothly. What is more irritating than to be in a hole—held up for materials—and upon entering the storehouse find the storekeeper sitting with a big smile on his face, like a king on top of the world, not seeming to realize how serious the condition is.

I remember an occasion during the Century of Progress Fair in Chicago, when passenger power was badly needed. We had two of a certain type of engines at the shops, one held for tire turning and the other for general repairs. When the tires on the first engine were being turned we found a check in the main axle. The first move was to see whether the stores department had received the last shipment of axles. It was the same old story: "Expect them to arrive any day now; will send a tracer or wire."

To make a long story short, we removed the main wheels on the second engine, rebored the boxes to fit, turned the tires to suit, ground the pins, took the eccentric rods and fitted them to the eccentric cranks of these axles, and replaced the wheels with the cracked axle. We used up enough man-hours to pay for two axles.

I recall an occasion in another shop when an important engine was being held up waiting for a set of piston packing rings. There were no overhead cranes in the shop. The tire turning lathe was served by an air hoist, the cylinder of which was 22 in. in diameter.

A trip to the stores department was rewarded with the statement: "Expect castings in early next week. (They seemed quite content that they were that near.) What do you guys over there expect? You used more ring castings last month than during the past six months."

"Yes," we replied, "but the stores shipped all the rings out on the road. You don't blame the shops for that, do you?"

And so, on and on, the old argument goes.

In the meantime the general foreman busied himself. "Joe," he said, "take down that air hoist from the wheel lathe and cut it up into 24-in. cylinder packing for 7409. She must be out of here tonight."

"But," said Joe, "how are you going to get the tires turned for 8492? She will be ready for wheeling day after tomorrow."

"How would you do it if the air compressor broke down?"

"Well, I guess we'd have to jack the wheels in and out."

"Well, go ahead any way you like best. Get the packing rings done tonight and the tires by the time they are needed."

Both jobs were done on time, but at what a cost! It was two weeks before another air hoist cylinder was completed.

These are typical of some of the little things which happen frequently. Too often we enter the storehouse and find empty shelves. An inquiry as to whether a particular part had been ordered is met with a reply that it will be done by the twentieth of the month, when the general check-up takes place.

I believe that every storekeeper should have a working knowledge of the mechanical department, thus enabling him to supply the materials on time and keep the wheels turning without so much grief to the mechanical department.

Jim Evans, the roundhouse foreman in your story, seemed to be out of luck all the way around. Jim should have larger sleeves so that he could tuck away certain parts for emergencies.

I do not believe in stocking the store shelves with materials that will in time become obsolescent, but I do believe every storekeeper should keep the polish off the seat of his pants. There is an old saying that, "When a workman slows up beyond reason he needs a shot in the arm to pep him up."

We really do like the fellows in the stores, for they are a jolly, good-natured bunch and are willing to do all in their power to help us over the rough spots, although it must be admitted that they are partly responsible for our being in these spots. A lot of cooperation could be used to eliminate waste time and man-power.

Foreman.

Why So Many Obsolete Locomotives?

To the Editor:

The chart reproduced in the advertisement of The Baldwin Locomotive Works is worthy of more serious thought than any other item in the January *Railway Mechanical Engineer.* In studying it, the question that naturally arises is, just why has the construction of steam locomotives in the United States almost ceased? This situation cannot be charged entirely to the financial condition of the railroads. Net earnings of railroads in other countries have also shown a marked decline from the figures recorded in more prosperous days, but nowhere has the renewal of the locomotive stock been neglected to the same extent as in the United States. In Great Britain, for example, approximately 4,500 new steam locomotives have been placed in service by the four main lines during the ten years from 1926 to 1935, inclusive. This represents about 22 per cent of the present locomotive stock of those railways. True, this percentage of replacements is still somewhat below normal, but it appears huge by comparison with the 7.8 per cent credited to the U. S. A. during the same period.

One thing that has been done in Great Britain might be applied with profit in America. I refer to the consolidation or grouping of railways, which has brought about a greatly improved motive power situation. The total number of locomotives necessary to move a given amount of traffic has been substantially decreased, and what is more important, the number of different locomotive classes in use has been greatly reduced. Complete

and rigid standardization of locomotive types is neither possible nor desirable, nor would any well-informed critic advocate consolidating all railways into one concern, whether operated privately or by government, but it is apparent that the highest economic efficiency cannot be attained with our present organization involving some 50 large systems, each purchasing engines in small groups, with more or less extensive differences between engines on adjacent lines in the same territory, and similar differences between successive orders for engines to be used on the same railway.

American railways seem to have no great difficulty in finding money for expenditures, which, in the light of past experience, are of debatable value from the standpoint of net earnings. I am somewhat puzzled at the sight of large sums being spent in a frantic effort to retain or regain passenger traffic, which in former years, with higher fares and under less expensive methods of operation, was generally considered unremunerative, while at the same time the great bulk of the locomotive stock is allowed to drift into obsolescence. Have the railroad managements concluded that some other form of motive power will shortly supersede the steam locomotive? Are they cautiously awaiting further developments which may lower the first cost and increase the dependability of the oil-electric locomotive? If so, they had better make a careful survey of the available oil supply before acquiring any considerable stock of internal-combustion engines. The known reserves of good coal in the ground are sufficient for an indefinite period, but the same cannot be said of our petroleum reserves. If we continue to use and waste oil at the present rate, the day may come in the not distant future when the increasing price of oil will force a return to coal in those regions where it is now unknown as a locomotive fuel.

One of the most noticeable features of recent American locomotive construction is the almost complete concentration on production of units of maximum power. An article in the May, 1934, *Railway Mechanical Engineer* shows that something over 40 per cent of the steam road locomotives in *active service* during August and September, 1933, were of the smaller and lighter types; 2-8-0, 4-6-0, 4-4-0, 4-4-2, 2-6-0 and 2-6-2. This would indicate that there is a definite place for efficient engines of medium power in present-day railroad operation. The large number of middle-aged, semi-obsolete *big* engines running about the country at the head of abbreviated trains only serves to confirm that indication. But the requirements cannot be filled properly by engines whose average age runs from 25 to 30 years. Vast savings in maintenance and fuel costs could be realized by replacing these old-timers, not with remodeled big engines working far below their nominal capacity, but with new engines specifically designed for the required power output.

Some railways, which are too well known to require enumeration, have a stock of switching locomotives which is sadly out of date. Saturated engines, with slide valves and Stephenson link motion, conforming to the accepted practice of 30 to 35 years ago, may still be found at work in more than one yard. I have in mind one large western railway, which has not bought a new steam switching locomotive in more than 20 years. Its yard work is largely performed by old 2-8-0 engines, long ago retired from road service, some of which date back to the middle nineties. Having light axle-loads and any amount of play in their running and driving gear, these engines are easy on the track and take curves and switches with facility. Superheaters have been applied to them, and their owners are no doubt convinced that great savings are realized by prolonging their lives indefinitely. Without going very deeply into the economics of the question, one has only to observe the performance of these ancient Consolidations and then contrast it with the work of up-to-date 0-6-0 and 0-8-0 locomotives on neighboring lines, to conclude that great improvement is possible, putting it very mildly.

Sooner or later, something will have to be done about that 62.5 per cent left over from pre-war days. The locomotive builders, whose very existence is at stake, have been hammering away on this subject for a long time. It is encouraging to note the support they are receiving from the Railway Age.

Wm. T. Hoecker.

Bootleg Tool Steel

To the Editor:

Some months ago I had an opportunity to visit a shop at a distant point on our line and in the course of my trip through the plant saw a man operating a heavy duty lathe. It struck me that I had seen him somewhere and I walked around to a point where I could get a good look at him and the work he was doing.

The operator was none other than Slim Wheaton, who had worked over on the "East End" about 16 years ago. By way of opening a conversation and to determine if he remembered me, I casually walked over to his machine and said: "Judging from the speed of the machine and the color of the chips, I see you are running her in 'high' today."

Slim straightened up and turned his head momentarily to discharge an overload of "Star" juice and replied, "It is easy to take a cut that is a cut and run her in high when you have tool steel like that."

"It looks just like any other tool steel from here," I replied.

"Well, Mister, you are badly fooled if you are going to judge a tool steel by looks, because performance is what that kind of steel is famous for."

"If it is as good as you say it is, Slim, I wish you would tell me all about it."

He proceeded to tell the whole story. He got the steel from a former buddy who was previously cut off in a force reduction and went out to the oil fields and found it in use there on heavy oil well tools. He liked it so well that he just didn't bother to throw out three or four pieces that happened to be in his kit when the work in the oil fields ended.

When he returned home he told Slim about his experiences and praised the tool steel enough to get Slim's curiosity aroused to the point that Slim borrowed it from him and liked it so well that he was using it exclusively. His only worry seemed to be what was he to do when it was used up.

It is just as natural for good mechanics to gravitate to good tools as it is for water to run down hill. There are a number of good tool steels that will pay for themselves many times over before they are worn out or used up.

Observer.

Believe It or Not—The Norfolk & Western vouches for this one. A little girl on one of their air-conditioned trains, on a blistering hot afternoon, looked out of the window and remarked: "Those boys out there certainly picked a cool day for swimming."

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Prompt Results From Convention Attendance

I have been impressed, too, with the rapidity with which ideas and devices discussed in associations like the International Railway Fuel Association and the Traveling Engineers Association find their way into practice. Evidently a considerable proportion of those in attendance go home and promptly test under their own conditions the things which they have heard discussed.

Technical Graduates on Railroads

I feel that one of the crying needs of the railroad industry is to bring in young men and to give such as are brought into the industry a broader line of instruction and guidance than has characterized the efforts of the industry in the past. I have in mind particularly technical graduates. It is my belief that technical graduates should be used by the railroads in other than engineering activities, as well as these.

Robbing Dead Engines

I like the Walt Wyre stories. While they may be a little exaggerated, anyone who has worked in a roundhouse can certainly enjoy reading them, since there are many situations in them that are encountered by roundhouse foremen. For example, last month I was on the day foreman's job. The storehouse not having material, it was necessary to rob three dead engines so that the other engines might be kept in service. A lot of extra work for a little material!

Use Your Head

We find the "Kid Glove Foreman" (January, 1936, page 34) working at the tramming of the drivers when he should have been overseeing or supervising. A supervisor should realize that whenever he elects to do the work no one is supervising his gang. While he may be making great headway on that particular job, the rest of the plant is literally going to hell. It takes a long time for some foremen to learn that the work belongs to the craft and that his business is to see that they are doing the work in an approved manner.

Many Supervisors Isolated

The supervisory forces located in the large railroad centers where they have an opportunity to visit with their neighbors and exchange ideas, or where there is a railway club, at the meetings of which good papers are presented and discussed on practical and technical subjects, have an advantage over the supervisor at the small town division point. The latter never gets out or sees anyone with whom he can exchange ideas or learn of the new mechanical appliances or devices that have been recently developed, unless some supply man comes along, and most of these have only been making the headquarters' towns in the last few years.

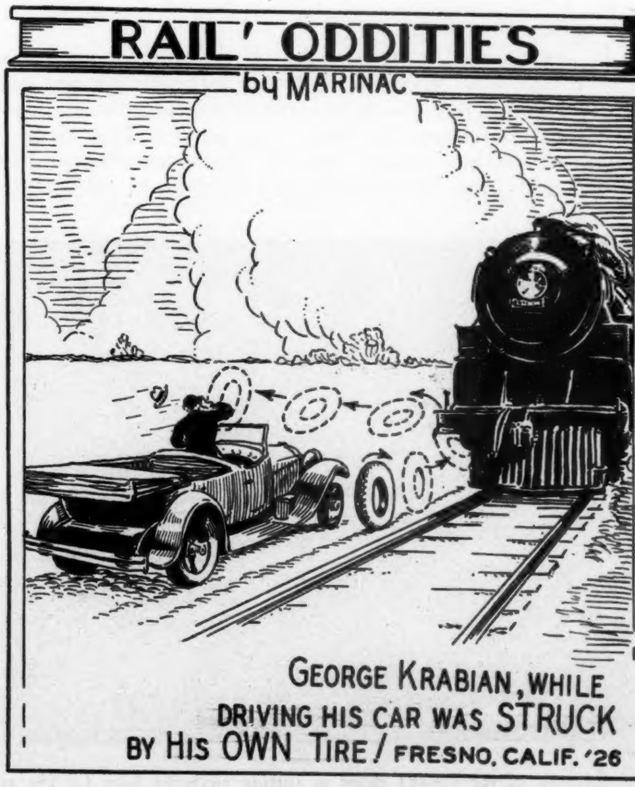
Keep Your Head!

As for the hat stomping ("The Kid Glove Foreman," January, 1936, page 34). I have seen that done more than once and always considered it so ridiculous that I have always felt that no matter what I lacked in other respects, I would never be that kind of a foreman. Foremen should ever be the coolest men on the job in every case, and especially in emergencies when the job is either won or lost in the course of a very short time. Anger drives out reason and always does more harm than good, and if the foreman has a few enemies it gives them a great deal of satisfaction "to get under his hide" and watch him literally "paw himself a hole in the floor," as one wag so aptly put it.

"Shimmying"

As regards Mr. Allen's article on rough riding (page 24, January issue), I believe he misses his step when he terms shimmying of a car due to one or two defects—eccentric wheels or clearance on truck chafing plate. Among truck men, the shimmy refers to just one thing—side shake due to wheels turned to the A. R. A. standard taper attempting to center on the track, with the result that they hunt or climb one taper and then the other, resulting in a twisting motion of the truck as one flange or the other hits the rail, which is communicated to the car with consequent unpleasant sideward vibration. The only corrective action anyone has found is to replace the outside pairs of wheels of truck where the shimmying occurs, which is an expensive procedure. It seems that very little wear is necessary to produce the shimmying condition.

* * *



For explanation see page 134

With the Car Foremen and Inspectors

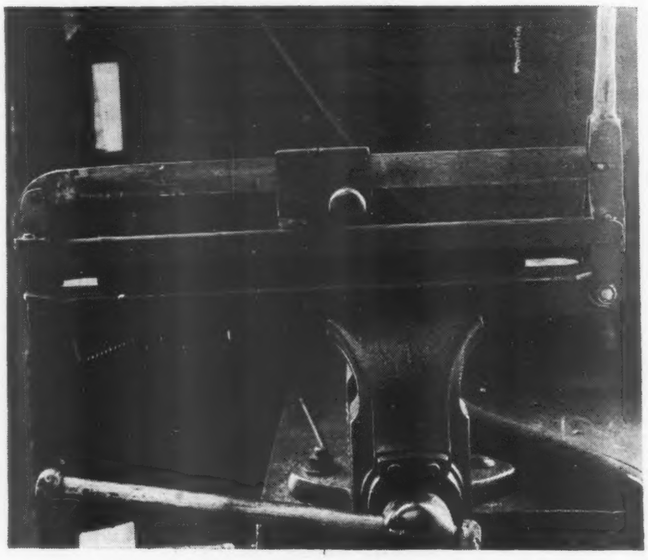
Tool for Slitting Air Brake Hose

It is common practice on quite a number of roads to apply sections of scrap air brake hose over various rods in the clasp-brake mechanism of passenger car trucks with a view to eliminating objectionable noises and also reducing the wear of these rods in metal guide brackets. In making these hose-guard applications, the hose are usually cut to the required length and slit with a hand-knife. They are then applied over the brake rods and wired in place, the guide brackets being widened where necessary to accommodate the increased diameter of the hose guard.

The hand slitting operation is a difficult one, owing to the tough material of which air brake hose is made, and there is also more or less danger of hand injuries in the operation. To overcome these difficulties, an ingenious device has been developed, as shown in the illustrations, and is now being used at the Omaha shops of the Union Pacific.

Perhaps the best idea of the construction of this device can be obtained from the view which shows it in the open, or unloaded, position. It consists of two 1½-in. base angles *B* 25 in. long, bolted together and held in the vise, with a hinged 1-in. pipe section *P* and a ⅜-in. by 1½-in. guide bar *G* which are always parallel and held in the upper position shown by means of the counter spring *C*. The slitting head *H*, moving freely on guide bar *G*, is provided with double handles and a knife edge which extends down into a groove cut along the top center line of pipe *P*.

In operation, the hose to be slit is applied over pipe *P* with the head *H* in the extreme left position and the parallel guide bar and pipe pulled down until the hose is compressed over holding dogs *D D*. The locking handle *L* is then swung upward and over the ends of pipe *P* and guide bar *G* so as to lock them in place. The operator stands at the right of the device and, by means of a single quick and strong pull on the handles, the hose is slit the full length and the momentum of the head *H* releases locking handle *L*, the guide bar and pipe fly up under the action of the spring mentioned, and the hose can be readily removed from the device. A



The tool in the closed position with a hose slit for about one-half its length

1-in. angle *A*, hinged on the left, is designed to be locked in handle *L* when the latter is in the upper position and serve as an additional holding feature on the hose. It is necessary to use this feature only when a second cut is to be taken in order to widen the slit and permit applying the hose guard around a brake rod of smaller diameter.

A tool used at the Omaha shops in slitting air-brake hose for use as brake-rod guards

How Passenger Trucks Cushion the Jolts

By separating the compact assembly of springs, rods, brake riggings, etc., of the passenger car truck into its component parts, the functions of the various springs, etc., can be easily understood. The spring system can be separated into two main parts: First, the spring assembly that takes up the jolts between the track and the truck frame, and, second, the spring assembly that acts as a buffer between the truck frame and the car body and thus allows the car body to "float" on springs suspended from the truck frame.

The truck frame and springs with the center form assembly removed are shown in Fig. 1. A jolt from a track irregularity passes into the wheel and thence into the journal box which slides up and down in the pedestal guides. An equalizer bar rests across the top of the two journal boxes of adjoining pairs of wheels and moves up and down with the boxes. A coil spring (the equalizer spring) takes up this motion and acts as a

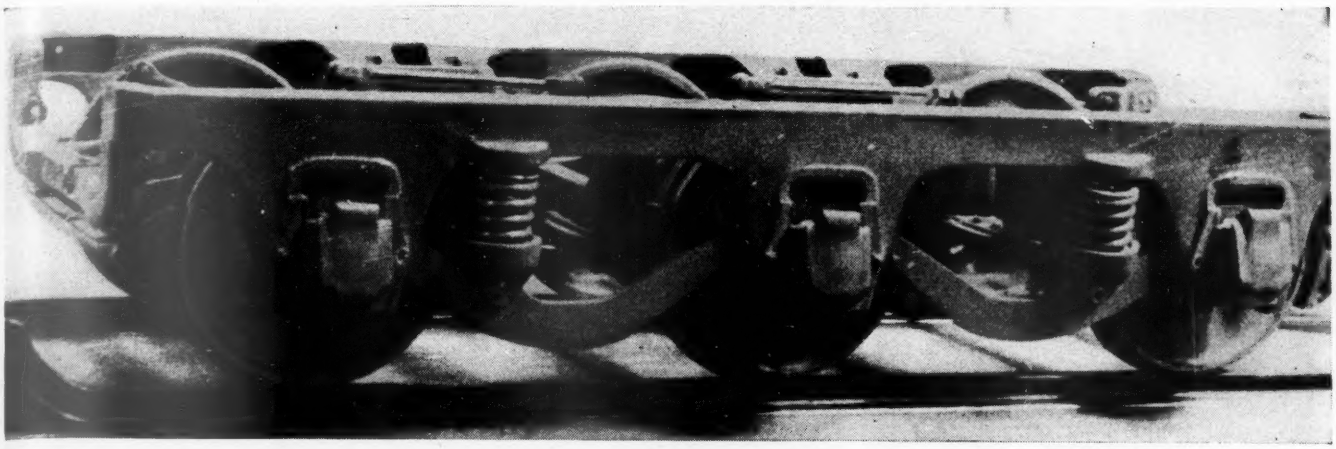


Fig. 1—Truck with equalizer bars and springs in place—Center form and bolster springs removed

cushion between the equalizer bar and the truck frame. The position of this coil spring (one-third of the distance between adjoining wheels) causes the equalizer bar to act as a lever and thus equalize the weight carried on each pair of wheels.

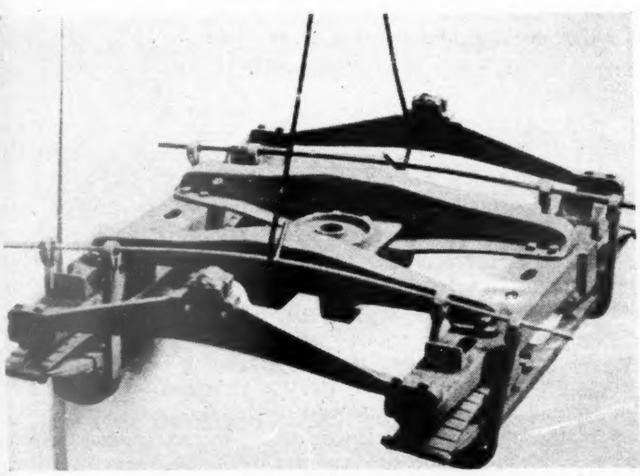


Fig. 2—Center form supported by bolster springs suspended from the swing hangers

The center form and elliptic springs which cushion the car body from the truck are shown in Fig. 2. This assembly is suspended from the truck frame by the four stirrups at the corners which are called swing hangers. Each swing hanger supports an elliptic spring (sometimes caller a "bolster spring") to which are fastened the center form with the center plate on which the car body rests.

The side arches connect the ends of the two bolsters of the six-wheel truck and support the side bearing rollers which prevent the car body from tipping by pressing against the side of the car frame. A "king pin" or pivot secures the car body to the center plate. The complete assembly of springs and parts in one design of a modern passenger car six-wheel truck is shown in Fig. 3. Thus we see that there are two complete spring systems operating in series between the truck wheels and the passenger car body. The coil spring system cushions rail shocks to the truck frame and the elliptic spring system still further cushions any shocks and dampens any vibrations which would otherwise be transmitted to the car body.

Odd Passenger

The latest in the transient world is the hobo snake. The Louisville & Nashville reports that it has heretofore been honored by being used as a means of locomotion by tramp dogs, cats, roosters and pigeons, but that it had never met a tramp snake until recently when a two-foot rattler was discovered riding on the coal tender of a southbound passenger train. A deep student of transportation matters, the serpent was making his way over the coal pile toward the engine cab when colored Fireman Enoch Fluker saw him. The rule book doesn't cover the matter of snake passengers, but Enoch has his own ideas on the subject; and the snake unwisely added insult to injury by making a sneering noise with his rattle. Aggrieved, Fireman Fluker fed him a fast one with the edge of his scoop and the snake rapidly became mincemeat.

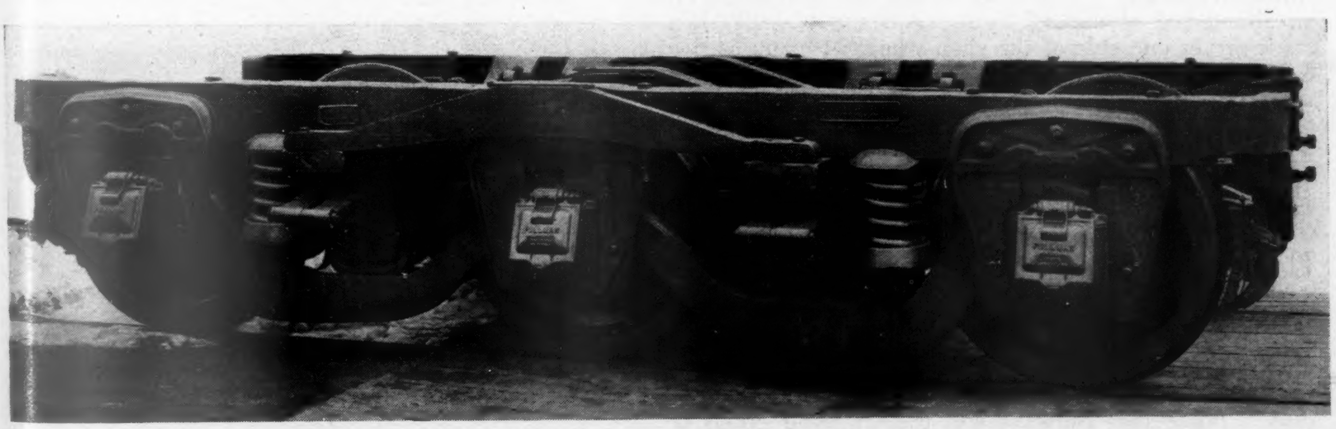
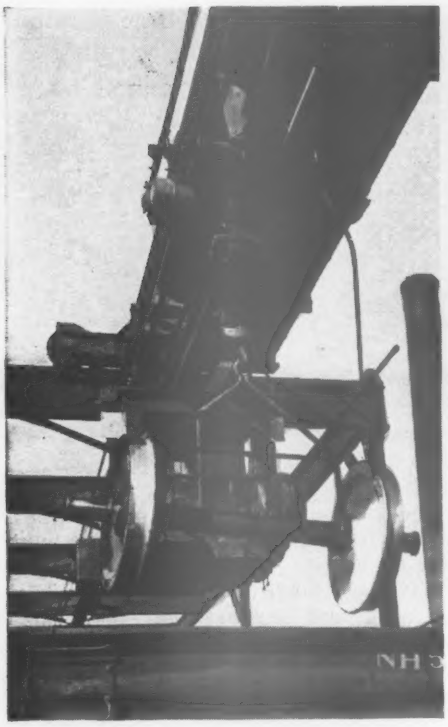
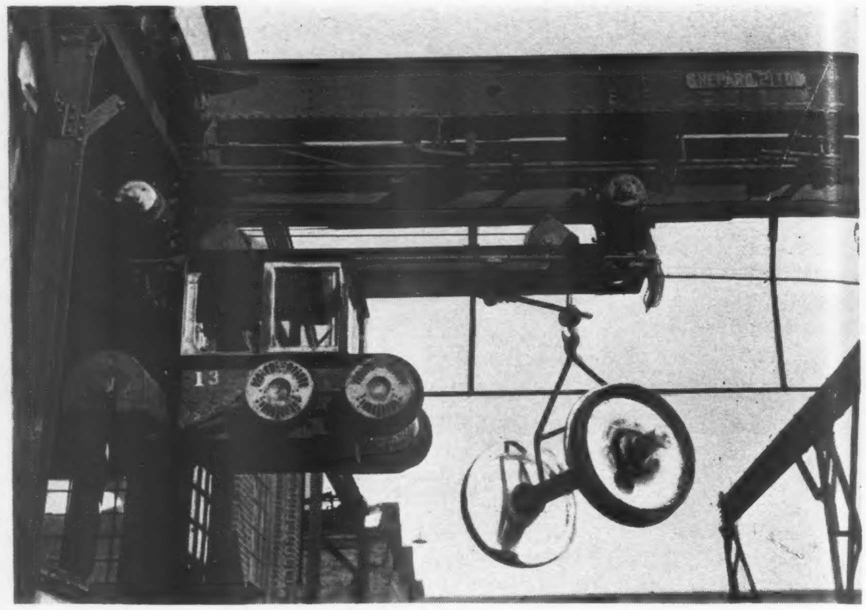


Fig. 3—Modern passenger car truck with center form and bolster assembled in place ready for service





At the left—a pair of finished wheels being loaded into a car by the monorail crane; Above—one of the monorail travelers on the bridge crane at the east end of the shop

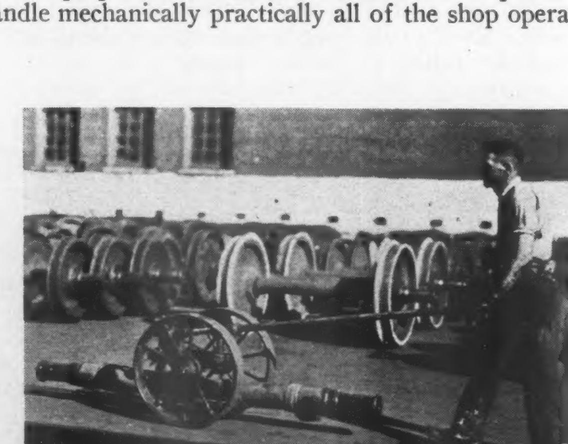
The New Haven

Readville Wheel Shop

In order to control the quality of workmanship and to assure conformity with standards established by the A.A.R. the New York, New Haven & Hartford has centralized all of its wheel and axle work for the entire system at its Readville, Mass., wheel shop. In a plant equipped with modern facilities for handling wheels and axles an average force of 20 to 22 men perform the operations necessary to turn out an average of 50 pairs of wheels, ready for service, each working day.

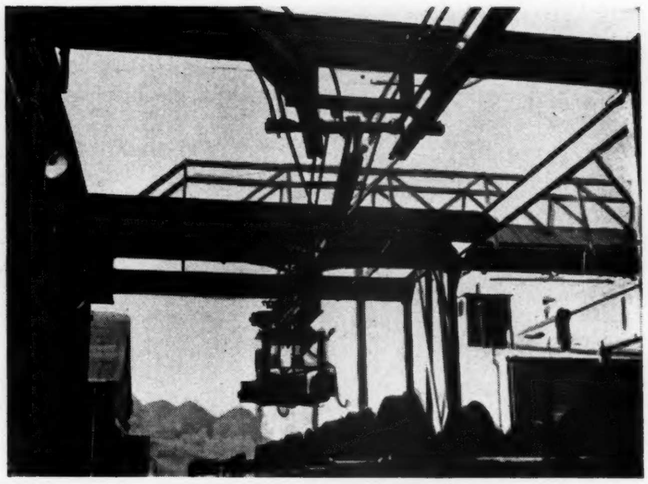
The arrangement and character of the facilities at Readville may be seen by referring to the shop layout drawing and the illustration accompanying this article. The wheel shop is housed in a brick and steel structure 75 ft. by 200 ft. in size, of ample headroom to permit efficient handling by overhead hoists, and provided with an abundance of natural light. A standard-gage shop track serves one side of the shop where as many as five cars may be spotted at a time for the unloading of wheels arriving at the shop from outlying points or the loading of finished wheels which are ready to be shipped. The shop track is on the north side of the building and along this entire side there is a two-ton Shepard monorail crane runway. On the east side of the building there is a single-girder traveling crane with a span of about 20 ft. which serves the area along the east wall where wheels are stored. The monorail runway outside the shop connects with a similar runway in the shop through a door near the west end of the shop. The inside runway serves all of the heavy machines along the north wall and terminates at a door at the east end of the shop. These two runways and the traveling crane at the east end are designed so that either of two monorail travelers, each of two tons capacity and controlled by an operator in a cab on the traveler, may run out onto the traveling crane at the end of the shop at two points—at the ends of both the inside and outside runways. When a traveler is on the bridge girder of the traveling crane all of the movements of the crane—longitudinally along the runway, transversely along the bridge girder and the hoist movements—are controlled electrically by the operator.

This monorail system, together with independent hoists and swinging cranes at individual machines throughout the shop, provides facilities which make it possible to handle mechanically practically all of the shop operations



Transporting an axle by hand

Defective wheels are unloaded from the cars on the through track outside the shop



A view in the opposite direction showing the monorail switch into the shop in the halfway position

necessitating the movement of wheels or axles from one point to another.

Machine Tool Arrangement

The shop building is divided longitudinally into three bays, a north and south bay each 30 ft. wide and a center bay 15 ft. wide, all 200 ft. long. In the north bay there are two doors, one in the north wall approximately 50 ft. from the west end of the shop and one at the east end of the bay. The heavy machinery is located in this bay. Along the north wall there is a Niles 300-ton single-end demounting press to the left of the door and, to the right, a 36-in. Norton car wheel grinder. Toward the east end of the bay, from this point, there are, respectively, two Sellers 42-in. car-wheel lathes, a Niles 250-ton double-end mounting press and, at the northeast corner, a Niles 36-in. car-wheel boring mill.

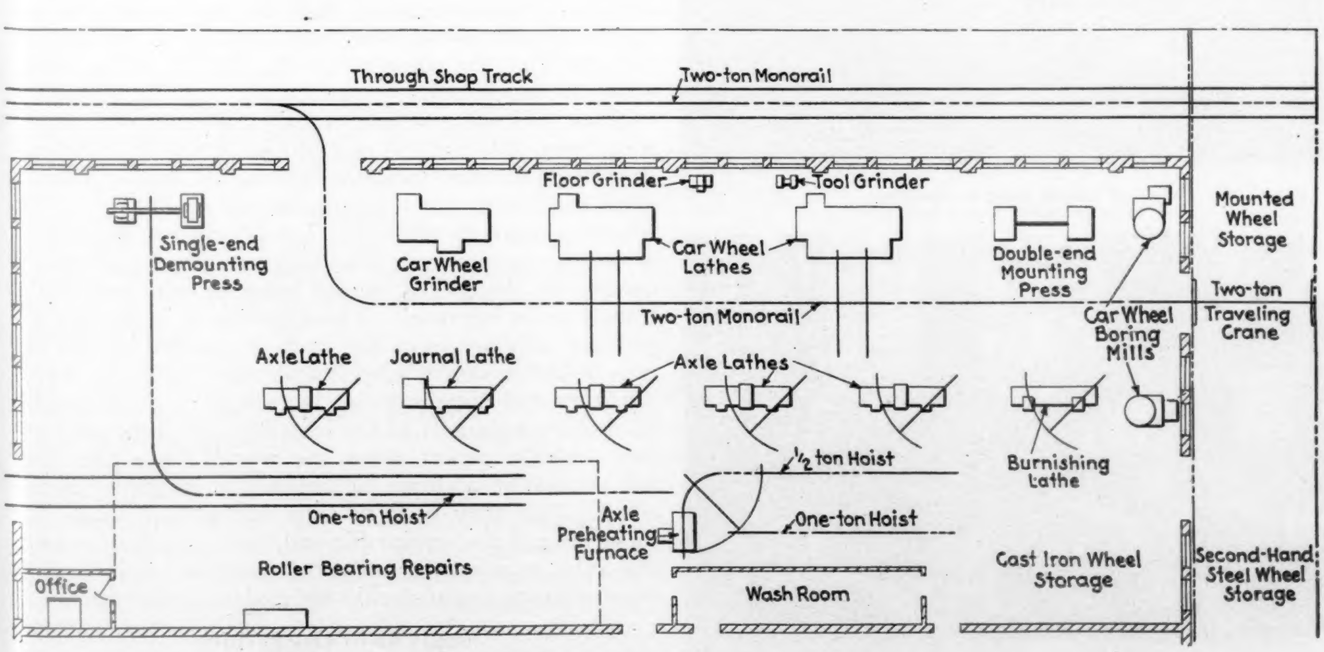
In the center bay, from west to east, in order, are a Putnam axle lathe, a Putnam journal lathe, three Putnam axle lathes, a Putnam journal burnishing lathe and a Putnam 36-in. car-wheel boring mill.

The south bay has outside doors at both ends of the building. The west half of the bay has been set aside for the servicing of roller bearings and most of the east end of this bay is used for the storage of cast-iron wheels. At the center, adjacent to a wash and locker room, is a furnace used for preheating axles preparatory to building up worn collars by welding.

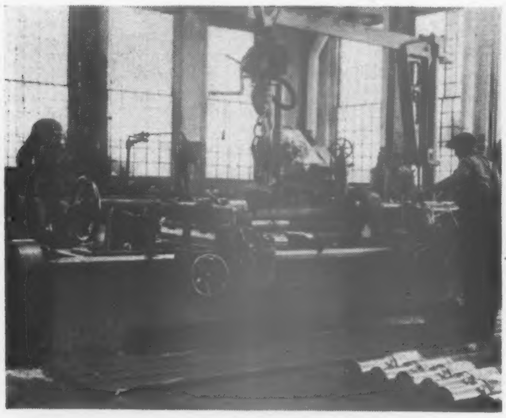
With the exception of the hydraulic mounting and demounting presses all of the machine-tool equipment of this shop has been in service less than 10 years.

Shipment and Inspection of Wheels

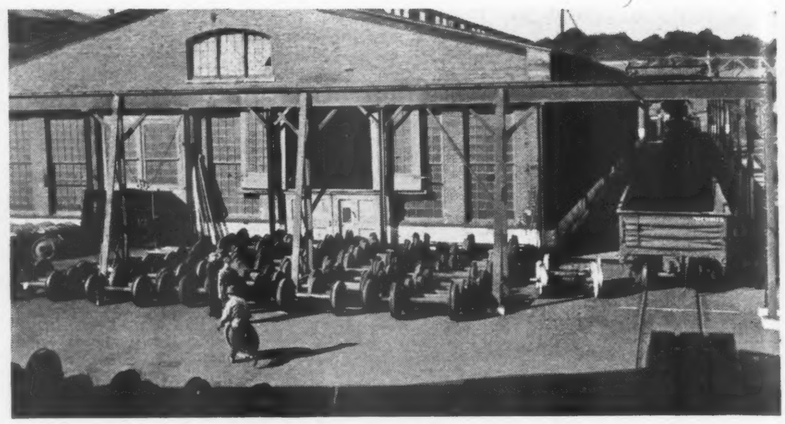
When a pair of wheels is removed from a car at any point on the New Haven because of a defect the inspector or foreman responsible for its removal attaches a tag to the axle. One of these tags is shown in an illustration. Upon the tag is recorded the identifying data, dimensions and a symbol which indicates the defect which caused its removal from service. A form, also shown, is filled out at the point of removal. This form shows the symbols indicative of wheel and axle defects as well as the wheel



The location of facilities in the Readville Wheel Shop



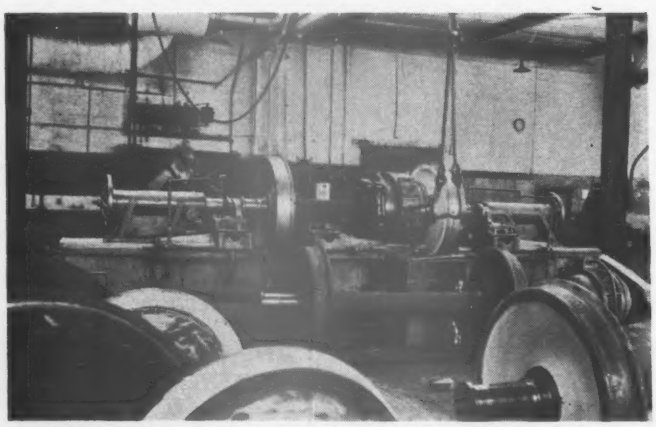
The burnishing lathe



The east end of the shop

One of the axle lathes

The heavy machinery bay



A journal lathe in operation

Car wheels are ground here

records such as serial numbers and the number and initials of the car from which removed. Five copies of this form are filled out at the shipping point, three of which are sent to the wheel shop, one retained by the shipper and one sent to the auditor of disbursements. After the wheels are received at the wheel shop and inspected the additional data is filled in on the three copies and two copies are sent out by the wheel-shop foreman—one to the stores department and one to the auditor of disbursements. From the two copies received by the auditor of disbursements—one from the shipper and one from the wheel shop—the correct billing repair cards are made out.

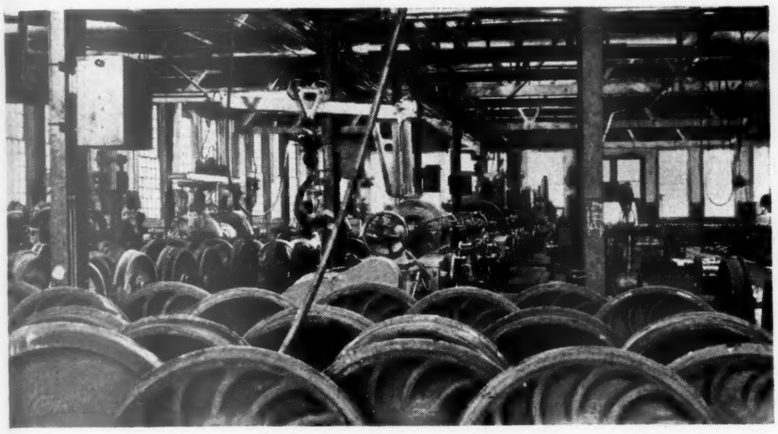
When defective wheels or axles, are received at the wheel shop they are first carefully inspected by the wheel-shop inspector who uses standard A.A.R. gages to determine whether or not the shipping tag accompanying the wheels is correctly filled out as to defects and dimensions as well as to determine whether there may be additional defects not discovered by the inspector who caused the wheels to be removed. The wheel-shop inspector's report not only serves as the basis of determining the nature of the repairs needed but also to record the actual condition and dimensions of incoming wheels and axles so that a comparison of the inbound shop inspector's report and the report when the wheels leave the shop will provide an accurate picture of what happened to the wheels while they were passing through the shop. By these records the service life and performance of wheels and axles may be watched and failures in service due to unsatisfactory workmanship reduced to a minimum.

Analysis of Operations

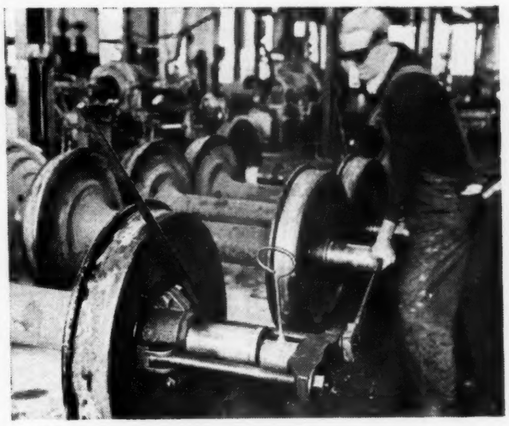
The wheels and axles which come to the Readville

Looking north along the midway

Roller bearing repair section



The center bay looking east



Pulling a roller bearing

Shop for repair and the work which is performed upon them may be segregated into four general groups:

GROUP A—CAST-IRON WHEELS

1—Serviceable axles with condemned wheels.
2—Condemned axles with serviceable wheels.
3—One wheel condemned; the other serviceable; axle O.K.
4—Axles serviceable with wheel treads to be reground.
5—Wheels serviceable with journals to be re-turned.
6—Boring of new or second-hand cast iron wheels.

GROUP B—STEEL WHEELS

1—Serviceable axles with condemned wheels.
2—Condemned axles with wheels serviceable.
3—One wheel condemned; the other is serviceable; axle O.K.
4—Wheel treads to be re-turned.
5—Wheel treads to be reground.
6—Journals to be re-turned (mounted wheels).
7—Boring new or second-hand steel wheels.

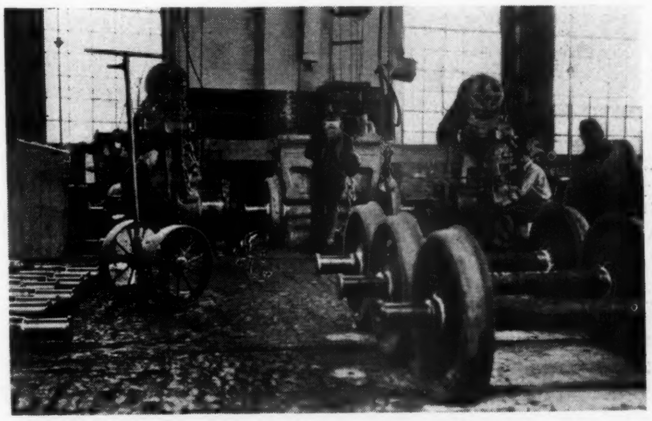
GROUP C—AXLES

New and second-hand axles (without wheels).

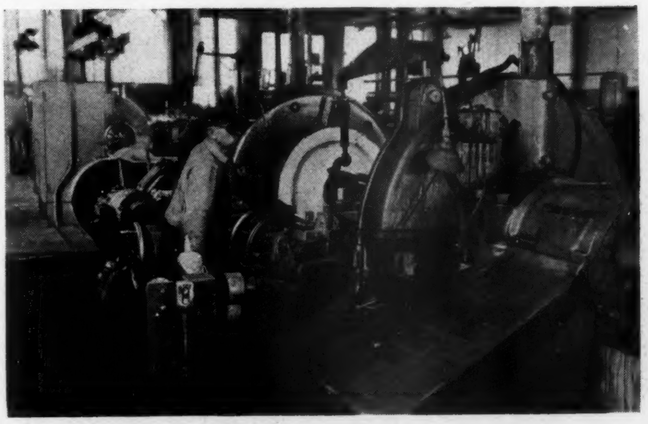
GROUP D—WHEELS WITH ROLLER BEARINGS

1—Wheels condemned.
2—Axles condemned.
3—Treads to be re-turned or reground.
4—Wheels and axles O. K.; roller-bearing repairs.

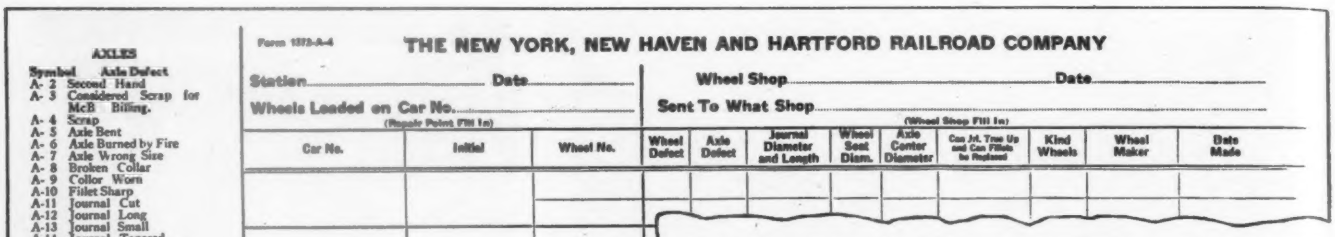
The above items in the four groups represent the most common conditions affecting wheels removed from service and sent to the shop. When they arrive at the shop they pass through various movements and operations depending upon the nature of the defects or repairs needed. These movements have been tabulated in

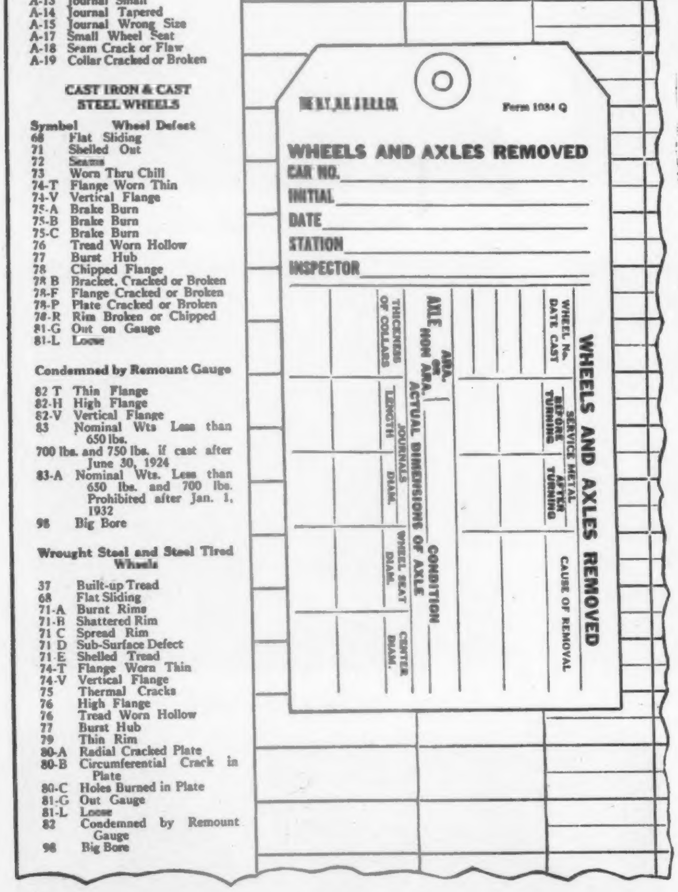


The double end mounting press



One of the two car wheel lathes





Two forms used in connection with wheel work, the larger being a shopping record of wheels sent to shop and the tag, indicating the defects, which is attached to the axle

Table I which is an analysis of each of the several conditions outlined in Groups A to D. For example in Group A the first condition (designated A-1) is that of a case where a pair of wheels is received at the shop with a serviceable axle and both wheels condemned. Reference to A-1 in Table I will indicate that the wheels are pressed off from the axle, the wheels sent to the scrap pile and the axle sent either to the axle lathe for re-turning or to the burnishing lathe for rerolling. Likewise each reference, such as A-2, B-3, C, and D-4, in Table I refers to a like numbered condition under Groups A to D.

A study of Table I will show that the work of the shop consists of handling (a) wheels and axle, mounted; (b) wheels, unmounted and (c) axles, unmounted.

Mounted wheels come in for re-turning or regrinding the treads or to have the journals re-turned and burnished. Wheels such as these are picked up from the car, after inspection and checking, and transported either to the wheel grinder, wheel lathe or journal lathe by

Table I—Movements of Wheels and Axles Through Shop

Group	Hyd. Press	Wheels 1	Wheels 2	Axle
A-1	Demount	Scrap	Scrap	To axle lathe or burnishing lathe
A-2	Demount	To second-hand storage or boring mill, as required.		Scrap
A-3	Demount	Scrap	Same as under A-2	To axle lathe or burnishing lathe
A-4	......	To Norton Grinder		(with wheels)
A-5	......	With axle)		To journal lathe
A-6	......	Storage to Boring Mill		....
B-1	Demount	Scrap	Scrap	To axle lathe or burnishing lathe
B-2	Demount	To second-hand storage or boring mill, as required.		Scrap
B-3	Demount	Scrap one wheel and send other to storage		To axle lathe or burnishing lathe
B-4	......	To wheel lathe		(with wheels)
B-5	......	To Norton Grinder		(with wheels)
B-6	......	With axle		To journal lathe
B-7	......	Storage to Boring Mill		....
C	......	....	....	Axle lathe to burnishing lathe to storage
D-1	Demount	Scrap	Scrap	To roller bearing department.
D-2	Demount	Storage	Storage	Scrap
D-3	......	To wheel lathe or grinder		(with wheels)
D-4	......	(Delivered direct to roller-bearing dept.)		....

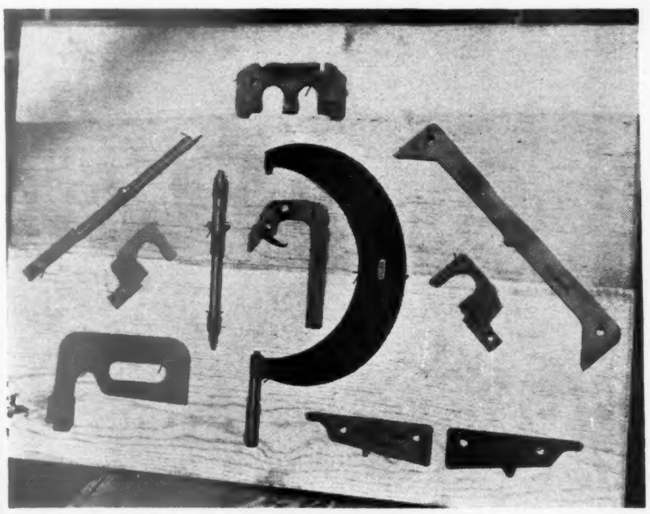
one of the monorail travelers and, when completed, are taken out the other end of the shop and loaded on a car for shipment. Wheels requiring demounting are delivered by the crane at the demounting press. The demounted cast-iron wheels go either to second-hand storage or to scrap. In either case they are handled by the crane—to a car on the service track spotted for scrap loading or to the southeast corner of the shop. The axles, if they require re-turning to true up journals or wheel seats are delivered by the crane to one of the

Table II—Readville Wheel Shop Production

	1	2	3	4	5	6	7
Cast-iron wheels bored (new) / Cast-iron wheels bored (second-hand)	1,158	962	1,546	1,796	1,120	1,204	1,702
Steel wheels bored (new) / Steel wheels bored (second hand)	207	284	168	163	249	116	345
Axles machined (new)—Turned and burnished / Axles machined (second-hand)— Wheel seats and journals turned, journals burnished	786	476	894	999	741	778	1,241
Mounted cast-iron wheels, treads ground, pairs	49	38	41	39	15	28	107
Mounted steel wheels, treads turned, pairs	207	237	277	260	244	258	372
Mounted steel wheels, treads ground, pairs	20	81	62	34	18	9	54
Cast-iron wheels demounted, pairs	662	775	819	929	803	821	1,159
Steel wheels demounted, pairs	212	113	209	307	142	93	199
Cast-iron wheels, mounted, pairs	574	538	767	954	596	660	858
Steel wheels mounted, pairs	98	146	73	85	87	110	170
Journals turned and burnished on mounted wheels, pairs	217	225	257	281	167	145	423
Roller bearing wheels serviced, pairs	31	56	44	51	27	18	33
Eight-hour days worked	25	20	24	26	22	21	25
Average number of men in wheel shop during month	20	20	20	20	20	20	29
Average number of pairs of wheels turned out of shop per day	39	52	55	56	44	50	63.8

four axle lathes, thence to the burnishing lathe to have the journals rolled and finally are placed in a pile adjacent to the burnishing lathe where the boring mill men "mike" the wheel seats and mark the axle so that the mounting-press operators may select the proper wheels (similarly marked) for mounting. All second-hand axles, whether they require truing or not, are burnished before being returned to service. New axles are worked through the shop as required.

In the case of unmounted steel wheels the second-hand wheels are transported from the demounting press to second-hand storage and the condemned wheels to the scrap car. The boring-mill operators draw from the new or second-hand steel or cast-iron wheel storage for wheels to bore for mounting. Wheels are mated by



A set of standard gages and micrometers used in wheel work—Among the gages shown are: the A. A. R. standard wheel gage, worn-through chill gage, wheel contour gage, journal fillet gage, tread worn-hollow gages and remount gages for cast-iron and steel wheels

tape size and are bored to dimensions taken from the axle on which they are to be mounted. The boring-mill operator measures both wheel seats on the axle and places a different chalk-marked number on each wheel seat. A wheel is then bored to fit each wheel and the wheel carries a number corresponding to that marked on the wheel seat by the operator. The tolerances and mounting pressures recommended by the latest A. A. R. Wheel and Axle Manual are adhered to. After mounting, the wheels are checked by an inspector before shipment and the wheelshop record previously mentioned is completed.

Shop Production

Some idea of the productive capacity of the machine tool units in the shop may be gained from the following list giving the output from one machine, in each case, in an eight-hour day:

Steel wheels turned	9 pairs
Axles turned	16
Journals trued on mounted wheels	12 pairs
Journals rolled	35 pairs (35 axles)
Cast-iron wheels bored	66
Wheels mounted	55 pairs

In addition Table II shows the production record of the Readville for seven months, six of which were consecutive months during 1935 which were typical of the operation under then existing conditions and the seventh month one of nearly maximum potential output without material addition to the force.

Are Interchange Rules 68 and 84 Fair?

By H. A. McConville*

The intent of the A.A.R. code of interchange rules, covering repairs, inspection, etc., of freight and passenger cars, is presumed to be fair and equitable to all concerned. With this thought in mind, we find the various committees of the association, from year to year, modifying the rules to meet changing conditions, rectifying any apparent irregularities or unfairness. To my mind there still remain in this code two rules that, being interpreted as they now are as handling-line responsibility, are manifestly unfair to the railroads. I refer to Rule 68, which covers slid flat wheels, and Rule 84, pertaining to cut journals.

In propounding controversial questions of this nature, the proponent should be in position to sustain his contentions with basic facts, hence I submit the following factual statements.

Rule 68—Slid Flat Wheels. There are three attributable conditions, which are mainly responsible for sliding wheels under cars. First, inoperative air brakes, due solely to some mechanical defect in the brake mechanism. Second, improperly proportioned or adjusted brake rigging. Third, moving cars with hand brakes set up too tightly.

Of these three conditions, inoperative air brake mechanism is by far the predominating factor in producing slid flat wheels. Fortunately, due to improved shop practices and inspection requirements, slid flat wheels as the result of the second mentioned cause are almost nil. The final factor—operating cars with hand brakes set—no doubt accounts for numerous slid flat wheels, especially in hump yards, mountainous country and other abnormal track conditions.

Since the first two mentioned factors are always considered owner's responsibility, and the rectification thereof is properly chargeable to car owners, any resultant damages from these conditions should likewise be chargeable to the car owners. Hence, in fairness to all concerned, Rule 68 should be modified to read: "Charges for renewal of wheels account of slid flat, when accompanied by charges for repairs to air brakes or brake rigging, will be rendered against car owner; slid flat wheels under any other conditions will be considered delivering line responsibility."

Rule 84—Cut Journals. This defect is invariably the result of some defective condition in the journal, journal brass, or other contained part of journal boxes or trucks, or of inferior packing. Repairs to any of these, separately or collectively, are properly chargeable to the car owner, except when associated with derailment, accident or when the journal is cut. The parts that most vitally affect the lubrication of the journals are more or less concealed from view, and the repacking date as stencilled on the car, and for which the car owner is responsible, is a literal guarantee that the condition of all journals and contained parts is good. Hence car inspectors are only required to give these parts the customary casual inspection in train yards and on interchange tracks. Contributing factors that might be in an embryonic stage of development of hot box trouble would not be obvious at the time of inspection, but may later develop a cut journal. As the rules do not require a general inspection of journals and contained parts within the prescribed time limit specified in Rule 66, I would suggest that rule 84 be modified to read: "Car owners will be

* Chief car inspector, Louisville & Nashville, Montgomery, Ala.

responsible for cut journals on their cars, except when caused by derailment."

I reiterate my statement that these rules as now in effect are unfair to the railroads. I say this because the railroads must assume the responsibility for these two defects on all cars in transit on their lines, regardless of the length of time such cars have been in their possession. You may readily appreciate the magnitude of this responsibility, when you consider that there are nearly half a million private line cars operating on the rails of the railroad companies of this country, the owners of which assume no responsibility, notwithstanding that many of them may have inadequate, incompetent or no repair or inspection forces.

With this in mind you may conceive the staggering amount of unfair maintenance costs imposed on the railroads by these two rules.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Temporary Repairs, Substitution of a Different Type of Truck Bolster

A St. Louis & O'Fallon car was shopped by the Peoria & Pekin Union on account of a broken cast-steel truck bolster. A Simplex structural steel bolster was applied and bill rendered against the owner in accordance with Item 188-B of Rule 101, in effect during 1934. P. & P. U. defect card was attached to car for labor only, for correcting the wrong repairs. The St. Louis & O'Fallon took exceptions to the charge rendered for material, contending that the Simplex truck bolster applied constituted temporary repairs only, and requested additional defect card to cover wrong material. This was declined by the P. & P. U. The St. Louis & O'Fallon contended that the third paragraph of Rule 87 applies for the reason that the repairs made were of a temporary nature only.

The improper truck bolster was removed and a bolster standard to the car applied, the car being considered unsafe to handle with bolster applied by P. & P. U. for following reasons (based on the facts set forth in the joint evidence statement submitted):

A—Excess column guide clearance permitted a side movement of car body of approximately 3¼ in. This would cause coupler to be out alignment and did not permit proper coupling to other cars.

B—The excess height of side bearing eliminates side-bearing clearance.

C—The oversized centerplate permits the car body to shift approximately ¾ in. in any direction and places undue strain on the center pin.

D—The slight difference in depth of center plates, prohibits body-bolster center plate from proper contact with the bottom center plate.

E—The ⅜-in. boss around the center-pin hole in truck bolster makes it impossible for body center plate to have proper bearing surface. It rides the collar or boss of bottom center plate, and does not have full bearing surface of a center plate with a flat bearing surface.

F—Elimination of rollers from Simplex bolster provides an unsatisfactory bearing surface.

In addition Simplex truck bolster measures 8 ft. 1 in. overall length while standard bolster measures 7 ft. 6 in.

The Peoria & Pekin Union contended that while the Simplex bolster was slightly longer than the cast-steel bolster removed, the center plate was an A.R.A. standard having a 12-in. bowl with 1¼-in. flange that it was used to expedite movement of this loaded car, that the work was performed in a workmanlike manner and that the car carried its load to destination and later returned home empty and that the bolster could have continued its service indefinitely had not the owner desired to remove it and apply a standard bolster. This road considered that it had complied with the requirements of Rule 88, utilizing its stock material to expedite the movement of a loaded car, and applied a defect card covering "Labor Only" for correcting wrong repairs.

In a decision rendered April 11, 1935, the Arbitration Committee said: "The evidence in this case indicates the bolster applied was unsuitable for permanent use under the car in question and can only be considered as temporary repairs. The contention of the St. Louis & O'Fallon Railway is sustained."—*Case 1745, Rule 87, St. Louis & O'Fallon vs. Peoria & Pekin Union.*

Charge for Application of Brake Beam Safety Guard Rivets

The Denver & Rio Grande Western charged the Kansas City Southern for labor of removing spring planks in order to apply brake-beam safety guard rivets, and K. C. S. objected to the labor of removing the spring planks, claiming that this was unnecessary. The K. C. S. stated that, by properly jacking the truck it was possible to apply these rivets without removing the spring plank as there is sufficient clearance for the rivets to be driven. The K. C. S. claimed it did not receive similar charges from other lines on this same equipment. The D. & R. G. W. contended that rivets could not be properly applied to cars of the construction of those owned by K. C. S. without either removing the spring planks, placing the car over a pit or securing the trucks to the car body and jacking the entire car, including the trucks, high enough to permit the operation of an air hammer from underneath the spring plank. It maintained that Item 98, Rule 107, applies only to jacking a car for removal of the truck or to secure sufficient space between the truck and the car body to make the repairs mentioned in Item 99, Rule 107, and that when necessary to remove any part of the car, not secured with rivets but necessary to apply rivets, Item 307 will apply and that repairing companies are not required to jack and block the trucks after removal from the car, in order to apply rivets, but instead may remove the part and charge the labor specified in Rule 107.

In a decision rendered April 11, 1935, the Arbitration Committee said: "It is common practice to R. & R. rivets referred to without removing spring plank from truck and charge should be so confined. The total labor for jacking, however, should not exceed one hour per end of car in cases where jacking is necessary. The contention of the K. C. S. is sustained.—*Case No. 1746, Rule 107, Kansas City Southern vs. Denver & Rio Grande Western.*

IN THE BACK SHOP AND ENGINEHOUSE

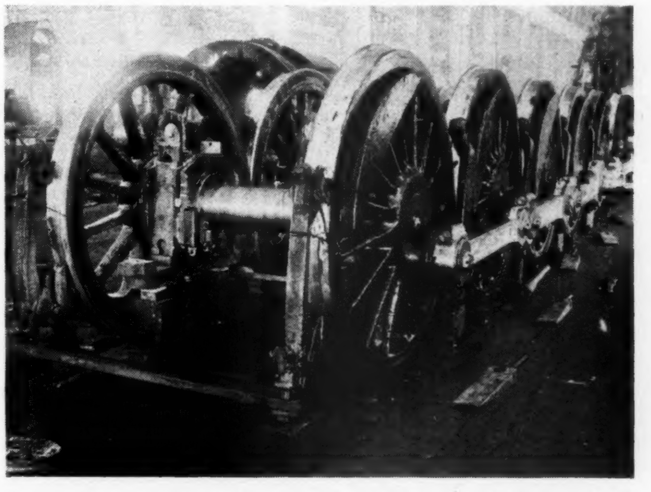
Omaha Locomotive Shop Kinks

Among numerous effective labor-saving methods used at the Union Pacific locomotive shops, Omaha, Nebr., special mention may be made of the practice followed in wheeling locomotives. This consists, as shown in the illustrations, of assembling the driving wheels, rods, binders, shoes and wedges, brake beams, hangers, etc., in place so that after the locomotive is wheeled, the subsequent finishing operations can be performed easily and in a very short time.

While this idea in the wheeling of locomotives is by no means new, it differs in a number of important particulars from the practice followed on most other roads. In the first place, the wheels shown are for a Union Pacific 9000-class, 4-12-2 type locomotive, the only locomotive with 12 coupled driving wheels used in this country up to the present time. The locomotive has three cylinders, the inside one being connected through a suitable piston, crosshead and main rod design to the inside crank axle of the No. 2 pair of wheels. The counter-weights on this crank axle and also the front end of the inside main rod are shown in one of the illustrations. Obviously it is much easier to apply this inside main rod to the crank axle before, rather than after, wheeling the locomotive.

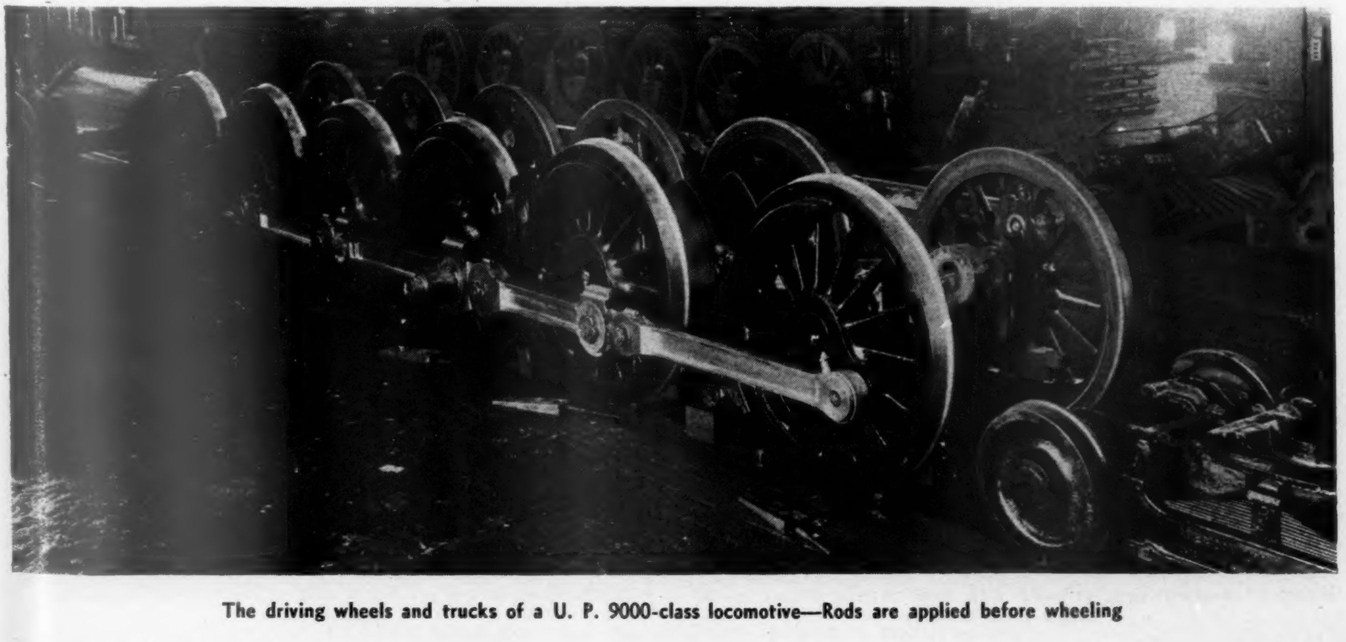
The general practice in wheeling locomotives by this method is to set the reconditioned driving wheels and boxes on the wheeling pit track, tram the wheel centers, apply the side rods as a coupled unit by means of a special chain suspension from the traveling crane and apply the inside main rod. A cross rail is applied in front of and one back of each pair of wheels, and a 15-in. channel, 56 in. long is placed across these rails under each driving box. On each channel is placed two 6-in. by 8-in. wood blocks, 12 in. high, with smaller wood-shim blocks on top, to support the binder at the proper height, in other words just touching the bottom of the driving box. The shoes and wedges are assembled in place and held in the driving box shoe-and-wedge ways by small wooden wedges. The brake beams and hangers also are assembled in place, being supported on wood blocks, and the upper ends of the hangers are tied against the driving wheels.

The front and back trucks are then set in place and the locomotive brought down the shop and spotted over the wheels, using the shop crane. The application of the inside main rod before wheeling introduces a slight



How the binders and brake rigging are blocked up ready for wheeling

complication in that the rod operates through a frame crosstie and guide yoke, and consequently the front end of the main rod must be raised and inserted through this guide yoke as the locomotive is lowered. This is accomplished by means of a chain-falls, suspended from the barrel of the boiler and used to keep the rod end at



The driving wheels and trucks of a U. P. 9000-class locomotive—Rods are applied before wheeling

the proper height as the locomotive is being lowered.

One of the great advantages of this method of wheeling is substantially reduced work in applying binders. The locomotive is lowered until the frame pedestal toes are forced down into the binder fit under sufficient pressure to spring the supporting cross channels slightly. The binder nuts are then easily applied and tightened and the binders are nearly up. The locomotive, after being raised slightly to remove all blocking, is then lowered until its weight rests on the driving-box spring saddles and the front and back trucks, Final driving up of the binders, tightening the binder nuts, applying brake rods, etc., is then an easy matter.

Setting Eccentric Cranks

A quick and accurate method of setting the eccentric cranks on driving wheels having hollow-bored axles is shown in the illustration. The particular wheels indicated are the main wheels for a Union Pacific 9000-Class locomotive, and being of the three-cylinder design, this locomotive has three cranks set 120 deg. apart. This same jig with a slight modification can however be used in setting the eccentric cranks on the conventional two-cylinder locomotive having the crank pins 90 deg. apart.

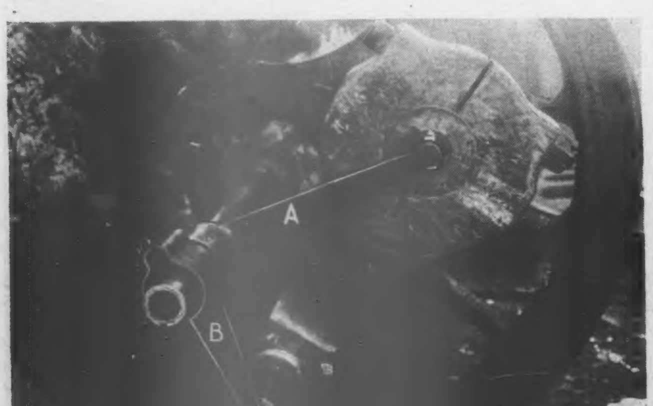
The jig consists of a 2½-in. steel shaft, 132 in. long, which extends all the way through the hollow axle, with an extension a little less than 3 ft. long on each side to accommodate sliding arms for checking the crank arm position. The main shaft is centered in the axle bore by means of two threaded cones, one of which is usually held stationary and the other drawn toward it by turning with a spanner wrench. This centers the shaft accurately in the axle bore. The inside arm *A* is an accurate sliding fit on the shaft. It is held in a fixed angular position by means of a sliding key and keyway and has a scribing point at the outer end just 16 in. from the shaft center line. This arm, in conjunction with a similar arm on the other crank pin, gives an accurate check of wheel "quarter" and stroke.

Similarly, arm *B* is an accurate sliding fit on the shaft but without any keyway connection. The distance from the shaft center line to the outer scribing point of arm *B* gives the standard "throw" of the eccentric, and also assures the correct angular relations, since the eccentric crank is made to standard length.

Applying Driving-Wheel Tires

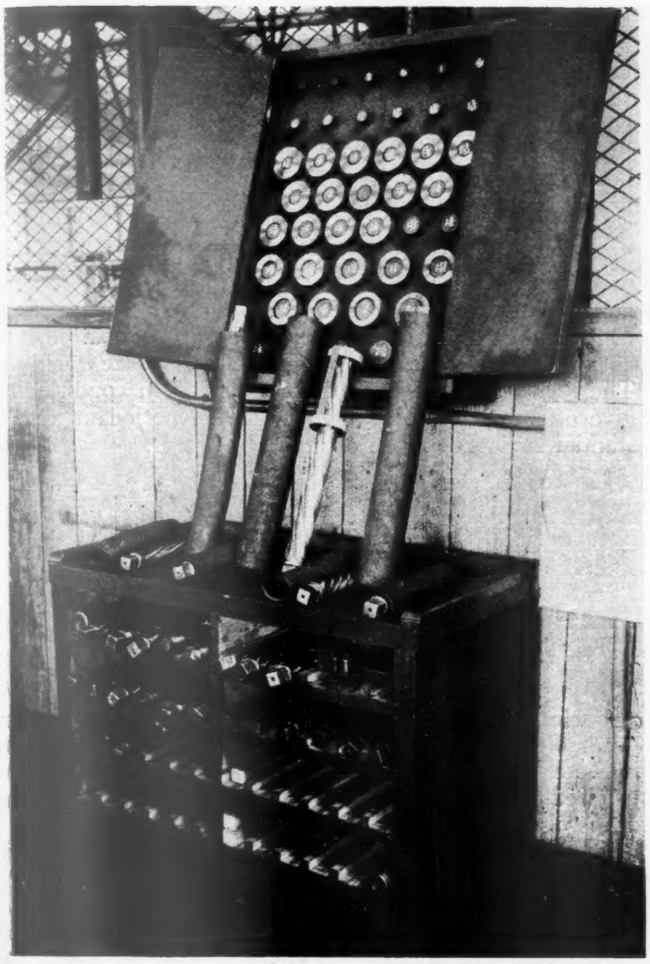
A double A-frame and equipment used in applying driving-wheel tires is shown in another illustration. The wheel centers mounted on the axle are held at the proper elevation by means of two taper plate metal supports, the upper ends of which are equipped with V-castings to hold the axle. The double A-frame is built up of an angle-section framework suitably braced at the bottom and tied together at the top by a wide steel plate which serves as a runway for two flanged wheels and hooks designed to support chain falls which in turn are used to hold the tires at approximately the same elevation as the wheel centers. The usual heater rings, shown in the illustration, are applied over the tires which are then heated and expanded enough so that it is a relatively easy matter to apply them over the wheel cen-

A clear passage way is maintained through the erecting shop—Electric-light extension cords are carried overhead



Eccentric checking gage as used with main driving wheels having hollow-bored axles

Double A-frame and equipment used in shrinking on locomotive driver tires



Pratt & Whitney ring gages used in checking reamer size and taper at Omaha shops—Reamers are protected in boots

ters by proper adjustment of the chain falls and a few light hammer blows.

Keeping Erecting Shop Passageways Clear

Another illustration shows how a clear passageway is maintained at all times past the often-congested finishing track in the erecting shop. After locomotives have been wheeled and the scheduled out-of-shop time is only a few hours away, it is often necessary to concentrate quite a number of machinists, pipe fitters, jacket men and cab fitters on a single locomotive, to such an extent that repair materials, tool boxes, electric-light extensions, air hose connections, etc., more or less block the passageway by the locomotive and interfere with the movement of men and materials to other parts of the shops.

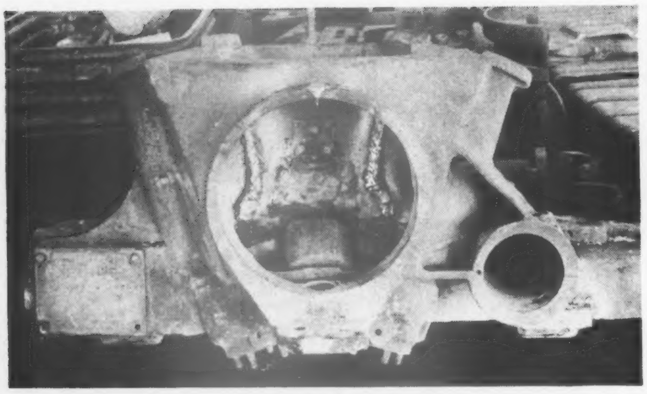
To overcome this difficulty, a passageway is kept clear at the Omaha shops of the Union Pacific, as illustrated, by lining up tool boxes in a single row where they are convenient to the workmen but leave ample space for the passage of trucks on the outer side. Air hose lines, where necessary, are carried across the passageway under a protective metal sheet. All electric-light extension cords are carried overhead across the passageway by passing them through an eye in the upper end of a 10-ft. length of boiler tube fixed in a circular base plate and provided with an eight-plug outlet box. Both the intake lead from the left to the box and all extensions used from the box to the locomotive pass through the upper eye support which keeps the extensions up high enough so that they will be well out of the way of workmen or trucks passing beneath. With this arrangement, a noticeably increased life of electric-light extension cords has been secured, as compared with permitting the cords to rest on the floor where they are subject to more or less unavoidable wear and abuse.

Care of Locomotive Frame Reamers

Locomotive frame reamers are given particular attention in order to make sure that the best results are secured in reaming bolt holes in locomotive frames, cylinders, guide blocks and other parts. A set of high-speed steel reamers, varying from $\frac{5}{16}$ in. to $2\frac{3}{8}$ in. in diameter and from 6 in. to 18 in. in length is maintained in the tool room on the ground floor, being sent to the upstairs tool room, after each use, for checking in order to make sure that they are sharp and in good condition for further service.

All dull reamers are ground on a No. 15 Brown & Sharpe universal tool grinder and Pratt & Whitney rings gages are used to provide an accurate check of the size and taper. These ring gages, made of especially hard-

Rolled and forged steel crank case completely fabricated by electric welding



Stoker hopper having cracks welded and steel elevator bushings and sealing rings applied by bronze welding

ened steel, are finished on the inside with an accurate taper of $\frac{1}{16}$ in. per ft. They are provided in $\frac{1}{32}$ in. sizes so that if one ring gage is applied over a reamer and the next size smaller gage fits the reamer at a point just 6 in. above the first, the reamer taper is shown to be correct. Incidentally, if the upper gage just fits the end of the reamer it indicates the reamer size at the end which is marked on the reamer shank with an electric etching tool.

These ring gages are quite valuable and to prevent losing them as well as to furnish protection against damage they are kept on circular wooden pegs in a cabinet, as shown in the illustration, with hinged doors which may be closed and locked. Both the gages and the pegs are marked to show the respective sizes. All ring gages are dipped in a lubricating oil once a week or more often, if necessitated by unusually damp weather, to make sure that they are kept free of rust or water marks of any kind.

The rack for holding reamers which are sent to the upper toolroom for inspection and resharpening is shown underneath the ring cabinet. This rack is substantially made of wood, being 3 ft. long by about 18 in. wide and 30 in. high and provided with eight separate compartments for accommodating a total of 48 reamers.

A feature of the reamer handling at Omaha shops is the provision of rubber protective boots, made of scrap air-brake hose, with a circular wooden block secured in one end of each and cut long enough to accommodate the respective reamer lengths. Reamers which have been inspected and resharpened are placed in these boots before being checked out of the toolroom, and rigid instructions are enforced requiring that reamers be kept in these boots at all times while out in the shop except when actually being used for reaming holes. This avoids the bad practice of carelessly placing reamers on the floor or even in tool boxes where the sharp reamer edges are nicked or in other ways dulled, by contact with concrete floors, steel tools or other hard parts. The result of all this precaution is to assure an accurate and keen cutting edge on all reamers used in the shop with consequent notable improvement in both the production of reamed holes, smoothness of the hole finish and accuracy of the bolt fits.

Welded Crankcase-Stoker Hopper

A crankcase for a six-cylinder internal combustion engine, entirely fabricated of forged and rolled steel by the welding process at the Omaha shops, is shown in the illustration. The outside parallel edges of the crankcase consist of two 4½-in. by 4½-in. steel bars, cut 5 ft. long and spaced 26 in. apart on the outer edges. The bottom of the crankcase consists of a ½-in. plate of boiler steel, rolled to the necessary shape and welded to the steel bars. The 4-in. crank-shaft bearings, including both end and intermediate bearings, are steel forgings supported by boiler-plate webbing and suitable end plates, all joined in a single well braced, rigid unit by the electric welding process. The crankcase is preheated before the welding operation and carefully normalized afterwards to relieve, so far as possible, all internal stresses.

A stoker hopper reclaimed by the bronze welding process is also illustrated. Steel bushings, made of rolled boiler plate, are applied in the elevators and new sealing rings in the bottom; also several cracks are repaired, and a broken supporting lug applied by bronze welding. The reclaimed hopper is thereby placed in condition to give effective service for an extensive period at a substantial saving in material and labor costs.

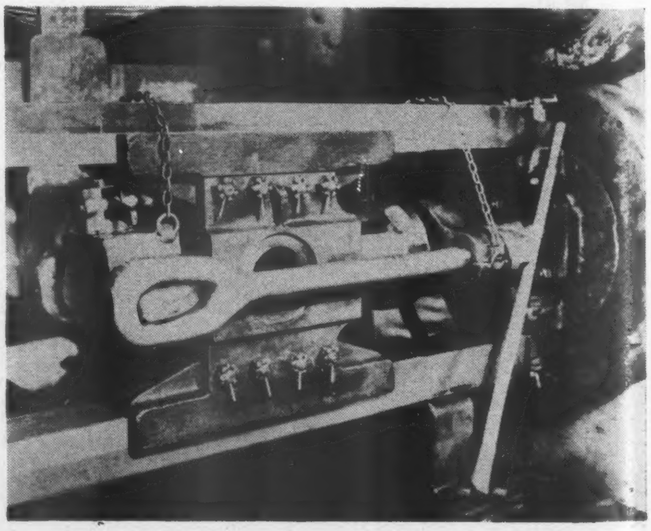
Piston-Rod And Crosshead Jack

By John L. Malone

A device that will remove the piston rods from the crossheads on locomotives without injuring the wrist-pin hole in the crosshead is shown in the illustration. It can also be used for general work as it will push or pull, raise or lower, heavy loads.

This portable tool comprises a compact hydraulic jack with a swivel head that operates independently from the ram, so as to permit the use of the lever from any desired angle. The jack itself is hung in place back of the crosshead by means of a chain around the top guide and a suitable space pin is inserted between the jack and the end of the piston rod. A split clamp is then suspended by a chain in front of the piston rod boss of the crosshead and the jack is anchored to it by means of two tie rods. Then, with a few strokes of the lever, oil is pumped from the reservoir into the ram cylinder, forcing the piston rod loose from the crosshead. The operation requires only a few minutes after the jack has been set in place.

This jack, as illustrated, weighs 96 lb. without the tie rods, space pin and clamp, and will develop a pressure in excess of 150 tons.



Jack for parting piston rod from crosshead without injury to wrist-pin hole

If it sinks, the coffee is too weak; if it floats the coffee is just right; but if the nail bounces, why the coffee is just a little strong

The Roundhouse Coffee Pot

by
Walt Wyre

The door-mat in front of the roundhouse office of the S. P. & W. at Plainville is a piece of front-end screen bolted to a frame of two-by-fours laid flat. Not much for looks, but strong and sturdy; that's what it takes in a roundhouse, and that goes for men, too.

If the mat hadn't been strong, Jim Evans, the roundhouse foreman, would have shoved a foot through it trying to shake the mixture of snow and congealed fuel oil off his overshoes. Snow alone is bad enough, but cold fuel oil sticks like a political grafter to the Government payroll.

After considerable stamping and scraping, Evans gave it up as a bad job and went in the office. He removed the soggy overshoes and stood them by the radiator to dry. He sat down in a much-patched office chair that had been thrown away as worn out by the superintendent, chief dispatcher and master mechanic in the order named. Evans slid to a comfortable position on the lower end of his backbone with his feet propped on an open drawer of the desk and took a chew of "horseshoe" to steady his nerves.

It had been a hectic day and the day wasn't yet over. First, it was the 5091—injector failed after the engine was set out ready to go on the Limited—lost thirty minutes. Then the 2870 threw up her tail and quit with a broken main pin fifteen miles out of town on a westbound Red Ball freight. An hour and a half delay wasn't so bad, but they had to send the 375 to take the train and that meant setting out twenty cars so the smaller engine could handle the train. On top of that, the motor car that made the branch line run was in the back shop for overhaul and the 375 was the engine planned for that run next morning. There'd be hell to pay over running a 5000 on the three-car branch line train, but nothing else to do. The 5075 was the only engine left for the Sanford line; every other serviceable engine available was marked up to run on other trains.

Evans settled in a comfortable position. The chew of "horseshoe" going good, he was trying to decide whether to spit or drown when the telephone rang.

John Harris, the clerk, answered it. "Yes, roundhouse clerk talking. . . . Uh-huh . . . O. K. . . .Wait, I'll ask him." Harris placed his hand over the mouthpiece and turned to Evans. "Train delayer wants a 5000 for a CCC train east at eight o'clock."

Jim expectorated a stream of tobacco juice that half filled the cuspidor. "Tell him there ain't no 5000—ain't

no engine at all. Ask him what's coming in on the train," he added.

Harris asked the dispatcher, listened to his reply and again covered the telephone mouthpiece. "Says there won't be no engine, we're getting the train from the Burlington. What'll I tell him?"

"Tell him to have them wood choppers get out and push!" Evans growled. "Aw, hell, tell him the 5075. Guess I'll have to work a gang overtime and get the 5092 off the drop-pit for the Sanford line," he added half to himself.

* * *

The foreman pulled on his steaming overshoes and waded out in the snow. Machinist Johnson and his helper were working on the 5092. The wheels were up and they had started on the rods. The pipe-fitter was working in the cab replacing pipes. Lewis, another machinist, and his helper were working on the 2817, another Class Six engine just stripped. Evans told Lewis and his helper to help on the 5092. He then went in search of Ned Sparks, the electrician, and told him to see what all was needed to get the electrical equipment on the engine ready to go.

"There's no dynamo on her, for one thing. You know we had to rob the one off her for another engine."

"Have you got one ready to go back on her?"

"No, haven't got the part yet. Guess we can get one off the 2817," Sparks told him.

"Well, get it going. Stay with it until it's finished." Evans climbed up in the cab of the 5092 to see how things looked in there. They didn't look so good, steam and air gauges were gone, one water glass was missing —used on other engines for running repairs, the injector had been taken off that morning to replace the one that went bad on the 5091. "Looks like an all night job," Evans mused, as he calculated the time required for the various jobs.

The two machinists and their helpers, a pipe man and helper, and the electrician were told to stay on the job until their work was done. They knocked off at six o'clock for lunch and were back at it.

"How's the coffee?" Johnson asked about nine o'clock.

"I'll see about it," his helper volunteered, and walked over to the "salamander" between the 5092 and the next pit.

In case anyone doesn't know what a salamander is, it is an improvised heater made from an empty oil drum in which coal is burned. The fellow that invented the salamander must have originated the saying, "where there's smoke there's fire," because six feet away from one, that's the only way to tell.

The coffee pot was setting on two pieces of flat iron on top of the salamander. Like the door-mat, the coffee pot was no utensil to grace a model home, but the coppersmith that turned the seams on it by hand was proud of it when he built it. It was made of sixteen-gauge galvanized iron and held between two and three gallons. Before the handle and lid was put on, it looked like a small petticoat pipe before the skirt is put on, broad at the bottom, tapering to the top. An occasional bright spot where solder had melted gleamed along the seams through a heavy coating of velvety black soot from letting the pot boil dry.

The machinist helper hefted the pot and decided there wasn't enough coffee in it. He filled it about two-thirds full with water from the wash-out line and set it back over the fire. He decided the coffee wouldn't be strong enough and dumped in a little over half a pound can of coffee. "Have to get some more coffee tomorrow," he announced when he got back to the 5092.

He yelled at the top of his voice

"Let's have some coffee," Johnson suggested about an hour later. Agreement was unanimous.

Cups were kept on a shelf in the adjoining tool room. They, too, were home-made from tomato cans with the tops cut off and edges turned down to make them smooth. One or two boasted handles.

Lewis set his cup on the ground and filled it with the steaming, black concoction. After blistering his tongue, he set it down to cool.

"How is it?" Sparks asked.

"Hotter'n hell!" the machinist replied.

"Strong enough?" Johnson's helper asked.

"Wait until I get my coffee tester," Johnson replied, feeling in his overall pocket.

"What you mean—coffee tester?" the electrician asked.

"Well, you see," the machinist replied seriously, "I have a tenpenny nail with the point ground sharp. I drop it in the coffee point first. If it sinks, the coffee is too weak; if it floats, the coffee is just right; but if the nail bounces, why the coffee is just a little strong."

"What are we having here—a tea-party?" The master mechanic had come up unobserved.

"Just having a little coffee, Mr. Carter," Machinist Jenkins replied.

"Well, it's no wonder overtime runs up! You men standing around drinking coffee when you're supposed to be working!"

The men all started back towards the drop-pit. The master mechanic stopped them. "Hey, wait a minute. Get rid of that coffee pot. If you don't, you'll all be ganged up drinking coffee again soon as I leave."

One of the helpers removed the pot from the salamander, emptied the coffee out and placed the coffee pot in the locker.

* * *

The 5092 made the branch line run in fairly good shape. Some of the boxes ran warm but that was to be expected of an engine right off the drop-pit. There was a 300 for the Sanford run next day and the third day the motor car was in from the back shop and ready for the run. The snow had about all cleared away and there wasn't so much trouble getting over the road.

Evans breathed a sigh of relief. Things were looking pretty good with the motor car back on the job. Not that he liked motor cars, far from it, but it gave him one more engine.

The motor car started out on time, gleaming spick and span with a new coat of paint. Evans stood out by the roundhouse office and watched it go by. When the staccato exhausts had died away in the distance the foreman bit off a hunk of "horseshoe" and went back in the office.

After looking over the mail, Evans went to see how things were getting along in the roundhouse. Everything was lovely. He went to the storeroom and visited awhile with the storekeeper and returned to the office.

"Now this is more like it," Evans remarked to Harris. "Everything jam up and ready to go with an extra engine O. K. for emergency—that's what I call railroading."

B-r-r-r! The telephone rattled noisily. "Hello. . . . Yes, clerk talking. . . . What? . . . All right, I'll tell him." Harris hung up the receiver. "Going to need that extra engine right now to send out for the motor car," Harris said.

"What happened?" Jim asked.

"Burnt out a bearing or something—that's what the dispatcher said."

Evans swore and went in search of the hostler.

A main crank shaft bearing was burned out on the motor car. Harry Clark, the motor car maintainer, was at loss to explain why. He replaced the damaged bearing and examined all the others. They looked good, so he O. K.'d the car.

Next trip two main bearings burned out. Evans wired for a traveling motor car maintainer. The car was tied up until the maintainer got there.

The traveling maintainer, a man named Davis, came in next evening. He and Clark worked on the motor car engine all night. Bearings were examined, oil lines blown out, oil pressure checked, and seemingly everything that might cause a bearing to burn was carefully examined. Davis rode the car next day. It hadn't made over fifty miles when out went a main bearing. He replaced the bearing while the motor car struggled along on one engine.

The car made the round trip after a fashion. They lost two hours going and almost three on the return trip. Main bearings burned out each time. When Davis got back to Plainville, he was dead on his feet. He told Clark to go home for the night and come back next morning.

A steam locomotive pulled the train next day. The 5075 broke a side rod the same day and that left Evans where he started when the motor car came back; turning engines as fast as they came in, holding them only long enough for a water change, fill the rod cups and pack the cellars.

Davis with Clark and his helper tore the motor car engines completely down. They pulled every piston in both engines and went over every part of the engines like Charlie Chan looking for clues to a murder. Davis was about ready to give up and call it a day when five o'clock came without having found anything that might be causing the trouble. He was holding a piston ring in his hand eyeing it in an abstracted manner. Suddenly he reached in his overall pocket for a scale. He measured the thickness of the ring; it was a sixteenth of an inch thicker than ones regularly used.

"Here's your trouble!" Davis told Clark. "Too much snap to the rings. That makes more pressure on the cylinder walls," he explained.

"Looks like it would burn out connecting rod bearings."

"Yes, it does," Davis admitted. "Anyway, we'll put in new rings the same thickness as ones that were in it before the car went to the back shop."

They worked all night putting in the rings and getting the motor car in shape. Next day the motor car went out on the run and failed, two main bearings burned out. On top of that, the crankshaft was found to be cut so badly that it would have to be renewed.

The master mechanic was frantic. After damning the man that invented internal combustion engines and the person that conceived the idea of using them on a railroad, he wired the factory to send a man to locate the trouble.

* * *

The man from the motor car factory and a howling snow-storm arrived in Plainville at about the same time, about three o'clock in the afternoon. The master mechanic came to the roundhouse with the expert from the factory. After introducing him to Davis, Carter went to the roundhouse office.

Although it wasn't four o'clock it was beginning to get dark. Blinding sheets of snow hurled by the wind plastered the north end walls of the office building. Double headers were called for both westbound passenger trains. The hostler and his helper were running around in circles trying to get engines in and out and keep the ones outside from freezing up.

Evans, muffled in sheepskin coat and fur cap, seemed

to be everywhere at once. Carter, anxious to help, borrowed a suit of overalls and a pair of gloves and pitched in. Five minutes in the blizzard and his ears began to turn blue. He went back in the office hoping to find a fur cap that would cover his ears. Everyone that had fur caps were using them. The clerk suggested using a flag. A red flag, it was a woolen one, was found. Carter folded it diagonally and tied it under his chin, then pulled his soft felt hat down on his head. He presented a comical appearance as he plunged out in the snow.

Carter went to the roundhouse and located Evans. He found the foreman helping the hostler. He had just run an engine in the house and was trying to close the doors when the master mechanic came up. Carter added his weight and the ponderous door swung reluctantly shut.

"Have you got the engines ready for the passenger trains?" Carter asked the foreman.

"Oh, yeah," Evans replied, "they're both ready and outside, one on the lead and the hostler is getting oil and water on the other. I told him to stay with the engines outside and see that none of them freeze up."

"Well, you're not in such bad shape," the master mechanic replied. "What else do you have to get out?"

"Well, there's not anything else except the 5074 for 71. It's doped in here about eight o'clock. Lots of time, but I thought I'd get it outside before the turntable pit gets full of snow. The way it's piling up we won't be able to turn the table much longer without a gang of men to clean it out, and I don't want to put men out there unless I have to," Evans added.

"Well, you get the engine out. I'll line up the table for you," Carter said. "What stall is it in?"

"In number twelve stall," Evans replied, as he walked away.

Carter had some trouble getting the table to turn. The traction wheels wouldn't grip the slick rails; finally he got it going. The blinding snow made it difficult to see when the rails were in line, but finally, with considerable see-sawing, he made it. The rails were in perfect alignment with those from the roundhouse for stall number *eleven.* After he got the table lined, Carter went over and helped Evans open the doors.

"Table lined?" Jim asked.

"Lined and locked," the master mechanic replied.

The foreman walked around the engine to see that everything was clear and climbed up in the cab. He kicked the cylinder cocks open and opened the throttle four or five notches.

Too late, the master mechanic saw that the table was lined for another track. He yelled at the top of his voice, but in the howl of the wind and the hiss of steam from the cylinder cocks of the engine, Evans couldn't hear him.

The first hint Evans had of anything wrong was a tearing, crashing sound as the back end of the tank tore into the turntable cab. Fortunately the engine was moving slowly. As it was, Evans barely managed to stop in time to keep the left rear tank wheels out of the turntable pit.

It wasn't much of a job to get the 5074 back on the track, but the turntable was a different story. The cab was pushed over until it seemed poised ready to dive in the pit. The drum controller was broken loose from its base and looked as though it would never see service again.

"Now ain't that a hell of a mess!" Carter commented when the 5074 was rerailed and run back in the house.

"Well, I guess we'd better call the bridge gang to fix up the turntable cab. I'll tell the electrician to see what can be done about the electrical equipment," Evans replied.

"The bridge gang's out of town; better tell the roundhouse carpenter and two or three machinists to work over and see if we can get the damned thing fixed up. You go on home, I'll stay until it's done," the master mechanic added.

"No, I'll stick around," Evans replied. "I'll get the gang started and take a look at the motor car. I'm anxious to see what's been causing the trouble with it."

Evans located the electrician, the roundhouse carpenter, and the three machinists and broke the news to them that they were to work overtime on the turntable. Johnson happened to be one of the machinists designated to work. That done, Evans went down to where the men were working on the motor car. He met the factory man coming out, a main bearing in hand.

"Well, what did you find?" the foreman asked.

"The trouble is the bearings—they're not the right kind."

"What's wrong with them?" Evans asked.

"Somebody bought bearings not suited for this engine," the factory man explained, "or rather not suited to the crank-shaft in it. These are a cadmium content bearing and they're too hard for the crank-shaft or rather the crank-shaft is not hard enough for them. They'd be O. K. with the proper crank-shaft. We'll have her ready to go in a couple of days."

"That'll be soon enough if this blizzard keeps up," the foreman replied and went to see how the men were getting started on the turntable.

* * *

It was a cold, mean job. A bonfire in the pit and another on the ground outside helped very little. Ned Sparks, the electrician, had rigged up a couple of flood lights so the men could see to work.

It was too cold for the men to walk home to supper. Evans had his car at the roundhouse and he went to town for sandwiches and coffee for the gang about six o'clock. That held them up for a while, but it takes more than a sandwich and a cup of weak restaurant coffee to supply energy and warmth on a job like that.

"Wish I had some coffee," Johnson said about ten o'clock.

Evans overheard him. "I'll go get some more in a little while," he offered.

"Aw, I don't mean that blamed restaurant belly wash—I mean coffee," the machinist replied.

"Well, why don't you go make a pot? I could use some myself." Evans hadn't heard about what happened a few nights before when the master mechanic found the men drinking coffee.

Johnson didn't wait. He beat it to the roundhouse and located the coffee pot. He filled the pot with water and turned steam from a blower line connection in it to heat the water. When the water was boiling hot, he dumped in a pound of coffee, the last on the place. After the coffee was in the pot, the machinist went in search of cups, leaving the pot on the salamander to boil.

"Hot coffee!" he announced to the gang around the turntable cab. The first cup poured he offered to the master mechanic.

Carter looked at it a moment, then took the proffered cup. A twinkle showed in his eyes as he sipped the concoction, thick and black as boiler compound mixed ready for the water tank.

"May not be very good, I lost my coffee tester," Johnson said.

"Don't need it," the master mechanic replied. "If it was any stronger I'd have to chew it and if it was any weaker, I wouldn't want it."

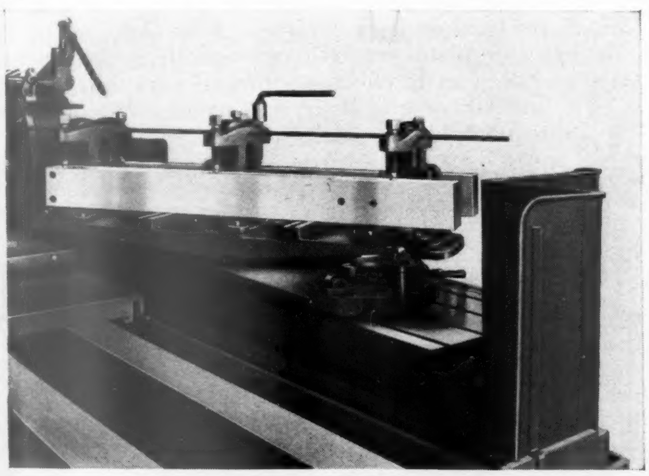
Work picked up after the coffee. More water was added and the pot set on the coals of one of the bonfires. At two a. m. the turntable was running.

Next day ten pounds of coffee was delivered to the roundhouse. The address was to the "Roundhouse Coffee Pot." Nobody asked who sent it—they all knew.

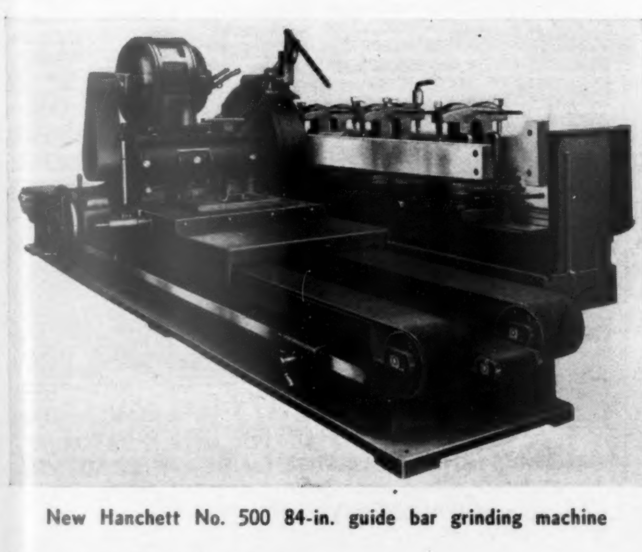
Improved Guide-Bar Grinders

The guide-bar grinding machines, built by the Hanchett Manufacturing Company, Big Rapids, Mich., have been improved in a number of important particulars. One of the things which has been done is to increase the dimensions considerably at several points where experience has shown this to be necessary or desirable. For example, the 30-in. diameter segmental grinding wheel is now carried on a 4-in. spindle mounted in preloaded precision ball bearings. Most of the railroad shops which have older type machines use 30-in. diameter wheels, but the new Hanchett guide-bar grinder is frequently fitted with 36-in. diameter wheels.

Various sizes of motors are used for driving the grinding-wheel spindle; but for guide-bar grinding, where heaviest cuts are being taken, a 35-hp. motor is now recommended. The motor is arranged to drive the wheel spindle by means of sheaves and V-belts. Sprockets and chain can be furnished if desired, but the V-belt type of drive appears to be more popular.



The indexing work table partially revolved



New Hanchett No. 500 84-in. guide bar grinding machine

Another improvement of considerable importance is the belt covering which is provided for the carriage ways and rack. This greatly assists in keeping them in condition for a clean and well-lubricated contact with the machine bed ways and the bull gear of the traveling carriage.

The special guide-bar fixture, which is adjustable for different sizes of bars, is pivoted at the center and can be indexed 180 deg. and locked. After one guide-bar has been positioned for grinding, a second bar can be set up on the opposite side of the fixture while grinding is actually taking place on the first guide-bar. In this way, practically no time is lost for loading, and it is possible to secure virtually twice as much production in guide-bar grinding as would ordinarily be obtained on machines without the indexing feature.

While this grinder is made in lengths up to 220 in., the 84-in. machine is usually adequate for most railway shops. This new Hanchett No. 500, 84-in., traveling-wheel grinder, complete with guide-bar fixture, weighs 20,000 lb.

Cleaning Small Taps And Tapped Holes

By Frank Bentley

The threads in small hand taps are in many instances hard to clean out quickly and thoroughly, either before or after making use of the tool. The finer the thread in many metals, the more important it is that the small tap be absolutely free of cuttings from another job in other metal. Around the shop where an air blast is always handy, it is easily done, but out on the road it is not so easy. Small taps are difficult to wipe clean with anything, and a handy cleaning device which can be kept in the small tool kit or carried in the pocket is simply an ordinary inexpensive suede brush. The bristles of this brush are just stiff enough and soft enough to serve for this purpose nicely. When not in use the brush is simply drawn up in the tube which is a part of the handle, and locked, protecting the light but stiff bristles and keeping them from contact with things in the pocket or tool bag.

Simple suede brush effectively used in cleaning a small tap

When tapping out small holes, which often bottom some depth from the end of the tap, it is of course necessary to keep the hole quite free and clean of chips and cuttings. Small taps are frequently and easily broken if this is not carefully attended to. When an air jet or

Rubber hydrometer bulb and tip used in blowing out small tapped holes

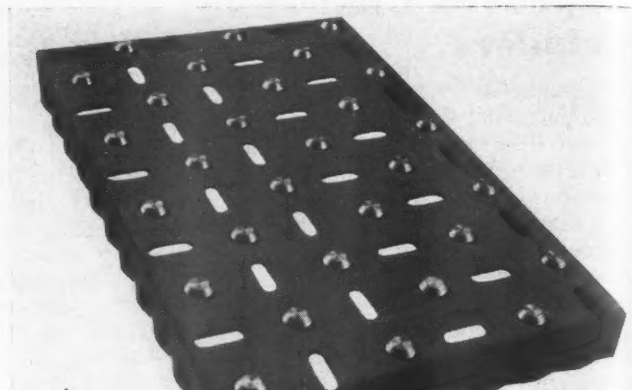
blast is not available a very handy device for this operation consists of a small hydrometer bulb and tip, used as shown. Compressing the bulb firmly and quickly sends a sharp strong air jet through the small end tip, which readily blows out dirt or chips in any small hole in the process of being tapped out. Made entirely of soft rubber, this little affair is indestructible and can be kept with any of the tools in the kit.

Bethlehem Steel Paving Plates

A new type of permanent and protective surfacing for concrete floors and paving, designed for installation on the surface of concrete slabs to which they are anchored and with which they become an integral part, has been placed on the market by the Bethlehem Steel Company, Bethlehem, Pa.

These Bethlehem steel paving plates are of ⅛-in. rolled steel and are available in two types. One is intended for use on roadways; the other for plant floors and loading platforms. Both types are identical, except that the one for roadways is equipped with button-head studs, making it a non-skid plate. As shown in the illustration, the sides are perpendicular to the surface and are so crimped as to give the plates a firm anchorage in the concrete. Additional anchorage is provided by studs which extend into the concrete, and, when these plates are laid the fresh concrete fills the slots to the top of the plate, providing additional bond between concrete and plate and increasing its non-skid surface. The road-type plate is applicable to thoroughfares, tunnels and bridges, that carry heavy continuous traffic.

The floor-type paving plate has a smooth surface. The long-shank anchorage studs with flat heads, fastening through countersunk holes, makes them flush with the top surface of the plate. Such smooth surface plates find application in shops, warehouses, docks, and loading platforms where heavy goods are ordinarily conveyed on



Road-type Bethlehem steel paving plate

trucks with steel wheels of small diameter and width which are hard on floor surfaces. Like the road plates, the floor type plates are anchored securely to the concrete slab and become, in effect, an integral part of it.

The standard size of Bethlehem paving plates is 12-in. by 18-in., with 1½-in. sides.

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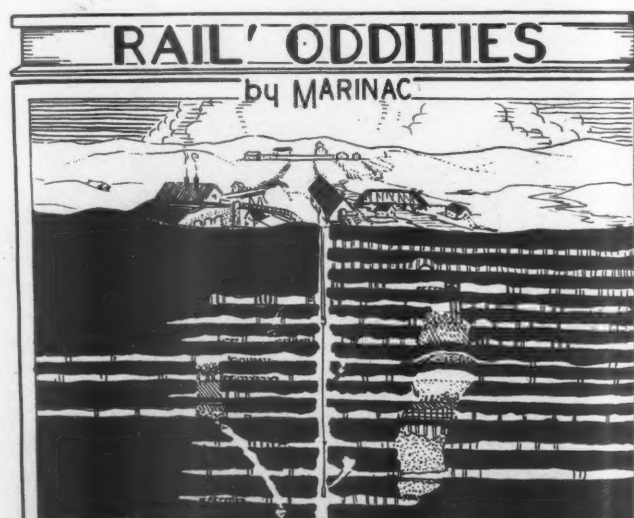


For explanation see page 134

Among the Clubs and Associations

CANADIAN RAILWAY CLUB.—Motion pictures and slides will be used to illustrate a discussion of air conditioning of equipment by S. M. Anderson of the Sturtevant Company, Boston, Mass., at 8 p.m. on March 9 at the Windsor Hotel, Montreal.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—At 10 a.m. on March 19 at the Ansley Hotel, Atlanta, Ga., Jas. Grant, superintendent motive power, Atlantic Coast Line, and E. C. Hasse, general manager, Oxweld Railroad Service Company, will discuss the operation of flame cutting machines.

NORTHWEST CAR MEN'S ASSOCIATION.—J. J. McDermott, representative of the Bureau of Explosives at St. Paul, Minn., will discuss the inspection and interchange of cars of explosives and other dangerous articles at the meeting to be held at 8 p.m. on March 2 at the Midway Club Rooms, St. Paul.

NEW ENGLAND RAILROAD CLUB.—At the fifty-third annual meeting, to be held on March 10 at the Copley-Plaza Hotel, Boston, Mass., a talking still picture machine will be used to show different types of valves, their construction and use in the railroad field. New officers will be elected. The meeting starts with dinner at 6:30 p.m.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings and places of meetings of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, c/o Westinghouse Air Brake Company, 3400 Empire State Building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—C. E. Davies, 29 West Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, 192 East Cedar street, Livingston, N. J.

MACHINE SHOP PRACTICE DIVISION.—G. F. Nordenholt, 330 West Forty-second street, New York.

MATERIALS HANDLING DIVISION.—F. J. Shepard, Jr., Lewis-Shepard Co., Watertown Station, Boston, Mass.

OIL AND GAS POWER DIVISION.—M. J. Reed, 2 West Forty-fifth street, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

ASSOCIATION OF AMERICAN RAILROADS.—J. M. Symes, vice-president operations and maintenance department, Transportation Building, Washington, D. C.

DIVISION I.—OPERATING.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

COMMITTEE ON RESEARCH.—E. B. Hall, chairman, care of Chicago & North Western, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION VIII.—MOTOR TRANSPORT.—CAR SERVICE DIVISION.—C. A. Buch, Transportation Building, Washington, D. C.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., 1519 Daily News Building, 400 West Madison street, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2271 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month, except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago, 7926 South Morgan st., Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, COUNCIL BLUFFS AND SOUTH OMAHA INTERCHANGE.—J. R. Leach, car department, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month at 1:15 p.m. at Union Pacific shops, Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—Mrs. M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, St. George, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony Building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 West Wabasha street, Winona, Minn.

INTERNATIONAL RAILWAY MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings, second Tuesday in each month, excepting June, July, August and September, at Copley-Plaza Hotel, Boston.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings, first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium Building, St. Paul.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately—June, in Los Angeles and October, in Sacramento.

RAILWAY CLUB OF GREENVILLE.—J. Howard Waite, 43 Chambers avenue, Greenville, Pa. Regular meetings, third Thursday in month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month, except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, Association of American Railroads.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

TORONTO RAILWAY CLUB.—R. H. Burgess, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July and August.

TRAVELING ENGINEERS' ASSOCIATION.—A. T. Pfeiffer (president), New York Central, Syracuse, N. Y.

WESTERN RAILWAY CLUB.—C. L. Emerson, executive secretary, 822 Straus Building, Chicago. Regular meetings, third Monday in each month, except June, July, August and September.

* * *

For explanation see page 134

NEWS

Safety at Portsmouth Shops

The Norfolk & Western reports that the men in its shops at Portsmouth, Ohio, worked from August 23, 1934, to January 24, 1936, or 519 consecutive days, without a reportable accident. During this time the number of man-hours recorded was 3,519,789. Working with this degree of carefulness, a shop employing 100 men might be expected to go with a clean record for 14 years.

Royal Blue Model Contest

The Baltimore & Ohio in conjunction with The Model Craftsman, a publication devoted to model building, has just launched a national contest for the best working model of the Royal Blue—the Baltimore & Ohio's new train between New York and Washington, D. C. Only amateur model builders and groups of amateurs, including railroad model clubs, are eligible to compete in the contest in which prizes totaling $1,150 will be awarded to winners—a first prize of $500; second prize, $300; third prize, $100; fourth prize, $50; and $25 each for the eight next best models.

The competition will close at midnight, November 15, 1936, and prizes will be awarded by five judges to be selected later.

P. & S. Division Invites Papers

A competition for papers on railway supply work has been announced by Division VI, Purchases and Stores, A. A. R. This contest will be similar to competitions held in previous years and is open to all purchases and stores department employees below the rank of assistant purchasing agent or assistant general storekeeper. The author of the two best papers will be invited to the next annual meeting of the division and will receive special mention in the annual proceedings. E. J. Lamneck, purchasing agent, Pennsylvania; C. H. Murrin, general storekeeper, Louisville & Nashville, and E. Harty, assistant general storekeeper, Southern Pacific, have been selected to judge the papers entered in the competition. Applicants may choose any subject related to the purchasing or the storing and distributing of material, and must submit their papers to the secretary of the division not later than April 15.

P.W.A. Railroad Loans Transferred to R.F.C.

Declaring that the railroad construction and improvement program financed by $198,000,000 of loans from the Federal Emergency Administration of Public Works "is one of the brightest chapters of P.W.A.," Administrator Harold L. Ickes on February 13 announced the abolition of its Division of Transportation Loans, organized in the Fall of 1933, and the transfer of its remaining activities to the Reconstruction Finance Corporation, which also has broad powers to make loans to railroads and which has purchased all of the railroad securities taken by the P.W.A. The R.F.C. has already resold $73,602,000 of the securities to private investors at a profit to the government of some $4,000,000.

C. B. & Q. Equipment Program

The Chicago, Milwaukee, St. Paul & Pacific will undertake a $5,000,000 equipment program, the Reconstruction Finance Corporation having agreed to purchase equipment trust certificates for 80 per cent of the value of the new equipment. An order has been placed with the American Locomotive Company for a streamlined steam locomotive of the same type now used on the Hiawatha, which will be used for relief service on the Hiawatha or for the operation of extra sections of the train. A total of 1,500 freight cars, including 1,000 automobile cars and five hundred 50-ton gondola cars, will be constructed in company shops. Passenger train cars to be built include 20 day coaches, 2 dining cars, 2 taproom cars and 3 parlor cars, all air-conditioned and partially streamlined, 5 baggage and 5 mail-express cars. All will be of steel-welded construction, about one-third lighter in weight than the conventional type car.

Improvement Programs

The Denver & Rio Grande Western plans to spend $6,000,000 during 1936 for the repair and rebuilding of locomotives, improvement of roadbed, air conditioning of passenger cars and the laying of rail in at least 60 miles of track. The program will be financed entirely by the earnings of the road.

The Illinois Central, which has borrowed $3,000,000 from the P.W.A. for repairs to equipment, has started its program. During 10 months, from January 1, 141 locomotives and 4,637 freight cars, including box, automobile and coal cars, will be repaired, while during the period from February to June 56 passenger cars, including baggage, coaches, parlor cars and dining cars, will be repaired. At the same time, 52 of these cars will be air-conditioned.

The Lehigh Valley on January 30 received a P.W.A. allotment of $1,755,000 which will be used to build 1,000 coal cars in the company's shops in Sayre and Pack-

New Equipment

Locomotive Orders

Road	No. of locos.	Type of locomotive	Builder
B. & L. E.	4	0-8-0	American Locomotive Co.
	10	2-10-4	Baldwin Locomotive Works
C. M. St. P. & P.	1	4-4-2 streamline	American Locomotive Co.
L. & N. C.	1	0-6-0	Baldwin Locomotive Works
Interoceanic of Mexico	5 [1]	2-8-0	American Locomotive Co.
Union R. R. Co.	5	0-10-2	Baldwin Locomotive Works
	5	0-6-0	Lima Locomotive Works
Union Pacific	15 [2]	4-6-6-4	American Locomotive Co.
Inland Steel Co.	3	0-6-0	....

Locomotive Inquiries

Road	No. of locos.	Type of locomotive	Builder
N. Y. N. H. & H.	10 [3]	Steam	....
Northern Pacific	12 [4]	4-6-6-4	....

Car Orders

Road	No. of cars	Type of car	Builder
A. T. & S. F.	50	70-ton triple hopper	American Car & Foundry Co.
	500	50-ton box	Pullman-Standard
B. & L. E.	1,000	90-ton hopper	Pullman-Standard
	750	70-ton hopper	American Car & Foundry Co.
	250	70-ton hopper	General American Car
C. M. St. P. & P.	250 [5]	Refrigerator	General American Trans. Corp.
Missouri Pacific	300 [6]	40-ton box	American Car & Foundry Co.
Phillips Petroleum Co.	10	Tank	General American Tank Car Co.
Shell Chemical Co. of California	15	8,000-gal tank	General American Tank Car Co.
Union R. R. Co.	600	70-ton gondolas	Pressed Steel Car Co.
	200	70-ton gondolas	Greenville Steel Car Co.
	100	70-ton gondolas	Ralston Steel Car Co.
	100	70-ton gondolas	Magor Car Corp.
Western Pacific	100	50-ton Hart selective ballast	American Car & Foundry Co.

Car Inquiries

Road	No. of cars	Type of car	Builder
Great Northern	500	75-ton ore	....
Northern Pacific	500 [7]	50-ton gondola	....
	250	50-ton flat	....
N. Y. N. H. & H.	50 [3]	Passenger	....

[1] These locomotives will have a total weight in working order of 119,000 lb., 18 by 22 in. cylinders and will be of 36-in. gage.

[2] These locomotives will be of the four-cylinder simple articulated type for fast freight service on mountain grades. They will have 22-in. by 32-in. cylinders, a total weight of engine in working order of 545,000 lb., a tractive effort of 100,000 lb. and twelve 69-in. driving wheels. The tenders will have a capacity of 19,000 gal. of water and 22 tons of coal.

[3] Subject to the approval of the court. The cars are to be similar to the 50 bought in 1934. Each will seat 92.

[4] These locomotives are to be equipped with roller bearings and will have a tractive force of 106,000 lb., a length of 127 ft. 1¼ in., a height of 16 ft. 4 in., a total weight in working order of 1,025,000 lb., and a tender capacity of 27 tons of coal and 22,000 gal. of water.

[5] These steel-sheathed refrigerator cars are being built for the Union Refrigerator Transit Company which will lease them to the C. M. St. P. & P.

[6] For use on the International Great Northern.

[7] This company will build 250 stock cars of 40 tons' capacity in its own shops.

erton, Pa. Previous loans to the Lehigh Valley total $5,345,000 for rebuilding old equipment and purchasing new cars and locomotives.

The Wabash has been authorized by the district court to spend $476,694 for repairing 1,310 freight cars and dismantling 394 freight cars and 16 locomotives.

The Northern Pacific will spend $4,000,000 for 12 locomotives and 1,000 freight cars and $338,000 for improvements to track, bridges and terminals to permit the operation of these locomotives in the Montana mountain territory between Livingston, Helena and Missoula.

The New York, New Haven & Hartford program for 1936 includes applying cast steel side frames in place of arch bar side frames on some 2,500 freight cars and making such other repairs as required, including painting.

The Chicago, Milwaukee, St. Paul & Pacific will undertake a $5,000,000 equipment program, the Reconstruction Finance Corporation having agreed to purchase equipment trust certificates for 80 per cent of the value of the new equipment. An order has been placed with the American Locomotive Company for a streamline steam locomotive of the same type now used on the Hiawatha, which will be used for relief service on the Hiawatha or for the operation of extra sections of the train. A total of 1,500 freight cars, including 1,000 automobile cars and five hundred 50-ton gondola cars, will be constructed in company shops. Passenger train cars to be built include 20 day coaches, 2 dining cars, 2 taproom cars and 3 parlor cars, all air-conditioned and partially streamlined, 5 baggage and 5 mail-express cars. All will be of steel-welded construction, about one-third lighter in weight than the conventional type car.

Air Conditioning

Canadian railways are making arrangements to introduce air conditioning into their train services, according to a joint statement issued by the managements of the Canadian National and the Canadian Pacific. For the coming summer several trains will be so equipped on the more heavily traveled lines of both companies. The fitting of present equipment will be undertaken gradually so that the types of air-conditioning devices used for the contemplated year-round operation will be the latest obtainable. Committees of mechanical and traffic officers of the two Canadian railways have been investigating air-conditioning devices for passenger equipment for some time and the work of equipping cars of both roads is now going forward. For the present year it is likely that this work will be confined to sleeping, parlor and observation cars. It is anticipated, however, that the air conditioning will be gradually extended to all passenger cars of practically all important main line trains.

The Illinois Central has placed an order with the Pullman Standard Car Manufacturing Company for Pullman shaft-driven, mechanical air-conditioning systems for 52 passenger cars.

The Waukesha Motor Company, Waukesha, Wis., has received orders for air-conditioning equipment as follows:

Chicago & North Western	28 ice engines
Illinois Central	1 ice engine
Missouri Pacific	1 ice engine
Texas & Pacific	1 ice engine

The New York, Chicago & St. Louis has placed an order with the Pullman-Standard Car Manufacturing Company for Pullman shaft-driven, mechanical air-conditioning systems for two coaches.

The New York Central is air conditioning 53 railroad-owned coaches and dining cars, and, in addition, the Pullman Company will air condition 22 cars for service on the New York Central, making a total of 632 air-conditioned cars on this road.

The Reading and Central of New Jersey have authorized a program of installing air-conditioning equipment in 21 passenger coaches as follows: On the Reading, 11 coaches, 3 combination cars and 2 cafe cars; on the Central of New Jersey, 3 coaches and 2 combination cars.

The New York, New Haven & Hartford has been granted permission by the United States District Court for Connecticut to air condition 46 of its passenger cars with ice units, which have been purchased from the B. F. Sturtevant Company, and 15 electro-mechanical and 1 ice unit purchased from the Safety Car Heating & Lighting Company. An additional 26 cars on this road belonging to the Pullman Company will also be air conditioned.

Supply Trade Notes

Henry S. Griffin, formerly general superintendent of the Morris Car Lines, has become associated with the Ajax Hand Brake Company, Chicago.

R. D. Bartlett, general manager of the Franklin Steel Works, Franklin, Pa., has been appointed assistant to the president of the Chicago Railway Equipment Company, with headquarters at Chicago.

The Markham Supply Company, Chicago, has been appointed general railway representative for the Chicago, Omaha, Neb., and Twin Cities territory for the Auto-Tite Joints Company, Pittsburgh, Pa.

James E. DeLong, executive vice-president of Waukesha Motor Company, Waukesha, Wis., has been appointed general manager. Mr. DeLong, who joined the organization in 1923, will also continue as head of the executive board.

Lester W. Seago, for the past ten years with the Ready-Power Company, Detroit, Mich., has been appointed eastern district manager, with office at 1775 Broadway, New York, and Wesley Davey, who has been with the company for over five years, will have charge of all Ready-Power service in the eastern territory.

J. M. Lammedee, formerly sales engineer of the Worthington Pump & Machinery Corporation, with headquarters at Chicago, has been appointed mechanical engineer of the Wilson Engineering Corporation, to succeed V. E. McCoy, who has resigned to become mechanical engineer of the Sullivan Valve & Engineering Corporation, Butte, Mont.

William Page, formerly sales engineer of the Acme Steel Company, has been placed in charge of the railway reclamation division of Erman-Howell & Co., Chicago, and C. A. Reagan, formerly associated with Briggs & Turivas, has joined the sales organization of Erman-Howell.

J. B. Strong has resigned as president of the Ramapo Ajax Corporation, a subsidiary of The American Brake Shoe & Foundry Company, at the age of 60 years. In the future he will act as a consulting engineer, particularly for The American Brake Shoe & Foundry Company and its affiliates in co-operation with its research department, with address 230 Park avenue, New York.

R. H. Sonneborn, formerly associated with the Youngstown Sheet & Tube Company, with headquarters at Detroit, Mich., has been appointed special sales representative of the tubular division of the Republic Steel Corporation, with headquarters at Cleveland, Ohio. Charles W. East, assistant manager of sales in the pipe division, with headquarters at Birmingham, Ala., has been appointed district sales manager, with headquarters at Houston, Tex., to succeed Robert E. Lanier, resigned.

The Peerless Equipment Company has elected the following officers: Chairman of the board, F. A. Poor; president, A. A. Helwig; first vice-president and treasurer, Philip W. Moore, with headquarters at 310 South Michigan avenue, Chicago, and vice-president, Floyd K. Mays, with headquarters at 230 Park avenue, New York. The Peerless Equipment Company continues the sale of the Peerless draft gears; the USL Battery Corporation's batteries for air-conditioning, car lighting, signaling and other purposes; the Journal Box Servicing Corporation's process and equipment for waste renovation and oil reclamation; and the Burgess Battery Company's dry cells.

A. A. Helwig, who has been elected president, was born at Minneapolis, Minn., in 1892, and served his apprenticeship in the mechanical department of the Minneapolis & St. Louis. Later he was employed in train service on this railroad, the Great Northern and the Chicago, Milwaukee, St. Paul & Pacific. In 1915 he was appointed general foreman of the Alton at Kansas City, Mo., and the following year became traveling inspector in the mechanical department. In 1917 he entered the Army as a second lieutenant and in 1920 resigned as a major after serving three years in France with the First Army Engineers.

He returned to railroad service in that year as superintendent of the car department of the Kansas City Terminal Company at Kansas City, and in 1925 resigned to become southwestern sales manager of the Bradford Corporation. In 1930 was

(c) Moffett Studio

A. A. Helwig

elected vice-president at Chicago and in March, 1932, resigned to form the Peerless Equipment Company.

George Dandrow, assistant manager of the New York district of the Johns-Manville Sales Corporation, has been appointed manager of that district with office at New York. Mr. Dandrow joined the Johns-Manville organization in 1922. After five years in its Boston branch, Mr. Dandrow joined the general engineering staff at New York and for the last few years has been assistant manager, New York district.

Frederick H. Thompson, vice-president and director of the Simmons-Boardman Publishing Company, publisher of *Railway Mechanical Engineer*, has been elected also to the board of directors of its parent company—the Simmons-Boardman Publishing Corporation—and Frederick C. Koch, also a vice-president of the former, has been elected to its directorate.

Mr. Thompson, who was born in Cleveland, Ohio, started his business career in 1902 as a newspaper reporter in New York and served for a time as a dramatic critic. From 1904 to 1907 he was eastern representative of the Music Trade Review, becoming in the latter year business manager of the American Engineer and Railroad Journal, a position which he held until 1912, when that publication was merged into the *Railway Mechanical Engineer*. Shortly after the merger Mr. Thompson joined the Simmons-Boardman organization as business manager of the *Railway Mechanical Engineer*, serving in that connection from 1912 until 1920, when he was appointed general manager for the

Frederick H. Thompson

Simmons-Boardman Publishing Company in the Central district, with headquarters at Cleveland, Ohio. In 1924 Mr. Thompson was elected a vice-president. He was elected to the Simmons-Boardman Publishing Company directorate in 1931.

Frederick C. Koch was born in Jersey City, N. J., on June 9, 1893, and was educated in the public schools of New York. He entered the employ of the Railway Age-Gazette in 1909 in a minor capacity and rose through various clerical positions to the managership of the advertising make-up department. In 1917 he became advertising sales representative for all Simmons-Boardman transportation publications with the title of assistant to vice-president. In 1925 he was appointed business manager of Railway Engineering and Maintenance, which position he still holds

Frederick C. Koch

along with the vice-presidency of the Simmons-Boardman Publishing Company to which he was elected in 1931.

Henry A. Wahlert, who retired in 1932 as representative at St. Louis, Mo., of the Westinghouse Air Brake Company, died in St. Louis on January 7.

Obituary

Harry Daniels, manager of the railroad department of the West Disinfecting Company, who died on January 19 at Evanston, Ill., of bronchial pneumonia, was born in Boston, Mass., in 1873, and started his railroad career at the age of 14 with the Concord & Montreal, now a part of the Boston & Maine. Later, he entered the employ of the New York, New Haven & Hartford, occupying various positions until 1908 when he left the railroad to enter the employ of the West Disinfecting Company as a salesman. In 1918 he was appointed manager of railroad sales for the United States and Canada.

Personal Mention

General

N. M. Eberhart has been appointed fuel analyst of the Florida East Coast, with headquarters at St. Augustine, Fla.

R. K. Carr, chief motive power clerk of the Norfolk & Western at Roanoke, has been appointed assistant to superintendent of motive power.

D. W. Cross has been appointed superintendent of motive power of the Detroit & Toledo Shore Line, with headquarters at Toledo, Ohio, succeeding J. F. Hazel.

Charles Scott Taylor, who has been appointed superintendent of motive power of the Atlantic Coast Line at Rocky Mount, N. C., was born on January 7, 1886, at Wilmington, N. C. He attended grammar school and McGuire's Preparatory School at Richmond, Va., and took International

C. S. Taylor

Correspondence School courses in mechanical engineering and on air brakes. He became a machinist apprentice in the employ of the Atlantic Coast Line on August 26, 1902. He completed his apprenticeship on September 4, 1906, and until June 1, 1909, was a machinist. On the latter date Mr. Taylor was promoted to the position of assistant enginehouse foreman at South Rocky Mount; on October 1, 1909, was transferred to South Richmond, Va.; on January 1, 1911, was appointed general enginehouse foreman at Florence, S. C.; on March 18, 1912, became general foreman at Wilmington; on January 1, 1918, was promoted to the position of master mechanic at Wilmington; on November 1, 1923, was appointed shop superintendent at Emerson shops, Rocky Mount; on June 1, 1933, was transferred to the position of master mechanic at Rocky Mount, and on January 16 of this year was appointed superintendent motive power, Northern division.

(Turn to next left-hand page)

J. B. Blackburn has been appointed engineer of motive power of the Advisory Mechanical Committee of the Van Sweringen Lines, with headquarters at Cleveland, Ohio, succeeding D. S. Ellis.

P. J. Norton, master mechanic on the Union Pacific, with headquarters at Pocatello, Idaho, has been appointed district superintendent, motive power and machinery, of the Central, Northwestern and Southwestern districts, with the same headquarters.

William S. Lammers, who has been appointed mechanical valuation engineer of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been with the Santa Fe in various capacities in the mechanical department for 32 years. Mr. Lammers was born on January 2, 1884, at Ft. Madison, Iowa, and received a public school, business college and correspondence school education, specializing in mechanical drawing and general accounting. He entered the service of the Santa Fe in 1903 as a enginehouse clerk at Ft. Madison, Ia., serving for the next 13 years at various points

William S. Lammers

in this capacity and as a car clerk, equipment inspector, machinist helper, machinist, shop timekeeper, head shop timekeeper, and assistant bonus supervisor. In 1916 he entered the valuation department as valuation assistant, later being promoted to office engineer and then to assistant mechanical valuation engineer.

D. S. Ellis, engineer motive power of the Advisory Mechanical committee of the Van Sweringen Lines, has been appointed mechanical assistant to vice-president of the Chesapeake & Ohio, the New York, Chicago & St. Louis and the Pere Marquette, with headquarters at Cleveland. Mr. Ellis was born on January 25, 1897, at Warwick, N. Y. He entered railway service in 1916 as a clerk in the office of the auditor of the Lehigh & Hudson River. In the following year he became a clerk in the office of the auditor of freight accounts of the New York Central, later serving as a machinist and as acting enginehouse foreman. In 1918 he became a draftsman and later served as a checker, calculator, designer and traveling engineer. In 1924 he was appointed assistant engineer and in 1925 became assistant engineer of motive power. On May 1, 1929, Mr. Ellis was appointed Eastern district manager, and subsequently manager, of the Railroad division of the Worthington Pump & Machinery Corporation. On October 1, 1932, he resigned from the service of the Worthington company to become engineer of motive power of the Advisory Mechanical committee of the Van Sweringen Lines.

D. S. Ellis

Master Mechanics and Road Foremen

S. C. Smith has been appointed master mechanic of the Central district of the Union Pacific, with headquarters at Pocatello, Idaho, to succeed P. J. Norton.

Willard Bourden Middleton, who has been appointed master mechanic of the Atlantic Coast Line at Rocky Mount, N. C., was born on October 16, 1882, at Warsaw, N. C. He attended North Carolina State College for two years (1902-1904) and entered the service of the A.C.L. as a machinist apprentice on June 7, 1904. Having been allowed six months on his apprenticeship for technical training he became a machinist on February 1, 1908. In February, 1909, he was appointed assistant roundhouse foreman; in the fall of 1911, became assistant to erecting shop foreman, and in May, 1912, was promoted to enginehouse foreman. Mr. Middleton acted as master mechanic for three months in 1918, and was appointed general foreman of the Emerson shops on November 15, 1920. He became master mechanic at Rocky Mount on January 16 of this year.

W. B. Middleton

Car Department

A. H. Muttitt, assistant car foreman of the Canadian National at Port Mann, B. C., has been appointed car foreman, succeeding F. Spick, retired.

Shop and Enginehouse

G. Shipley, locomotive foreman of the Canadian National at The Pas, Man., has been transferred to the position of locomotive foreman at Rivers, Man.

F. E. Demorest, assistant locomotive foreman of the Canadian National at Nutana, Sask., has been appointed locomotive foreman, with headquarters at Prince Albert, Sask.

P. J. Sproule, locomotive foreman of the Canadian National at Rivers, Man., has been transferred to the position of locomotive foreman at Sioux Lookout, Ont.

F. C. Parsons, a machinist of the Canadian National at Rainy River, Ont., has been promoted to the position of night foreman at The Pas, Man.

T. Leevers, locomotive foreman of the Canadian National at Sioux Lookout, Ont., has been transferred to the position of locomotive foreman at Transcona, Man.

J. C. Benson, enginehouse foreman of the Atlantic Coast Line, has been promoted to the position of general foreman, with headquarters at Jacksonville, Fla.

J. Carnochan, leading hand machinist of the Canadian National at the Transcona locomotive shop, has been promoted to the position of millwright foreman at Transcona, Man.

L. E. Hart, general boiler maker foreman of the Atlantic Coast Line, has been appointed general foreman locomotive department, with headquarters at Rocky Mount, N. C.

Peter Young, general foreman of the Corwith (Ill.) reclamation plant of the Atchison, Topeka & Santa Fe, has been appointed general superintendent of reclamation at the same point, to succeed R. K. Graham, deceased.

Purchasing and Stores

Elwyn T. Ricker has been appointed storekeeper of the Maine Central and Portland Terminal Company, with headquarters at Deering Junction, Me.

J. G. Stuart, assistant purchasing agent of the Chicago, Burlington & Quincy, with headquarters at Chicago, has retired because of continued ill health. Mr. Stuart had been 48 years in the service of the Burlington.

W. F. Myers, local storekeeper on the Chicago, Burlington & Quincy at McCook, Nebr., has been appointed general storekeeper of the Fort Worth & Denver City, the Wichita Valley and the Burlington-

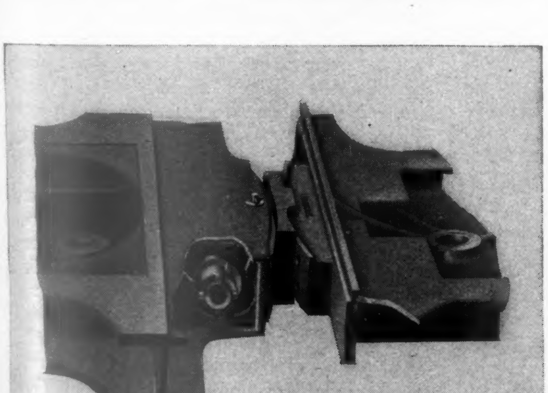
(Turn to next left-hand page)

Protection . . .

THAT INCREASES PASSENGER COMFORT

. . .

THAT REDUCES MAINTENANCE COSTS



A smooth riding engine means a smoother riding train and a big reduction in locomotive and track maintenance costs.

Franklin Type E-2 Radial Buffer is like a giant arm that grasps the engine and tender. While permitting absolute freedom of movement it steadies and avoids jars and jolts.

It maintains constant contact between engine and tender and provides spring controlled frictional resistance to compression which avoids lost motion and subsequent destructive shocks.

Like its Twin the Franklin Automatic Compensator and Snubber for Driving Boxes, it materially improves the riding qualities of the engine and saves many times its cost in maintenance expense.

When maintenance is required a replacement part assumes importance equal to that of the device itself and should be purchased with equal care. Use only genuine Franklin repair parts in Franklin equipment.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

Rock Island, with headquarters at Childress, Texas, succeeding George Baker, deceased.

J. C. Hart, chief clerk to the district storekeeper of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been appointed division storekeeper of the LaCrosse and River division, with headquarters at La Crosse, Wis.

D. H. Phebus, chief clerk to the general storekeeper of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been promoted to the position of district storekeeper of the Southern district, with headquarters at Savanna, Ill.

J. C. MacDonald has been appointed to the newly-created position of district storekeeper of the Tacoma district of the Chicago, Milwaukee, St. Paul & Pacific, with jurisdiction over the territory between Tacoma and Harlowton, Mont. Mr. MacDonald's appointment was made following the death recently of A. J. Kroha, assistant general storekeeper, Lines West, whose position has been abolished.

R. D. Long, general storekeeper of the Chicago, Burlington & Quincy, has been appointed purchasing agent, with headquarters as before at Chicago, to succeed Percival Hunter, deceased. Mr. Long has been connected with the Burlington for more than 43 years. He was born on February 22, 1877, at Aurora, Ill., and entered the employ of the Burlington on November 1, 1892, as a messenger at the Aurora store. In March, 1901, after having held various positions at that point, he was promoted to foreman, which position he held until October, 1906, when he became chief clerk at the Aurora store. Mr. Long was transferred to the office of the general storekeeper at Chicago on February 1, 1910. Four years later he became assistant general storekeeper at that point and late in 1931 he was appointed general storekeeper.

R. D. Long

G. A. Goerner, traveling storekeeper of the Chicago, Burlington & Quincy, with headquarters at Chicago, has been promoted to purchasing agent of the Colorado & Southern (a unit of the Burlington System), with headquarters at Denver, Colo., to succeed William C. Weldon, deceased. Hal D. Foster, inspector of stores on the Chicago, Burlington & Quincy, has been appointed traveling storekeeper, with headquarters at Chicago, to succeed G. A. Goerner.

Obituary

Percival Hunter, purchasing agent of the Chicago, Burlington & Quincy, with headquarters at Chicago, died in that city on February 3, of heart failure.

Charles D. Van Schaick, retired combustion expert for the New York Central, died at his home on Shippan Point, Stamford, Conn., January 19, after several weeks' illness. He was seventy-three years old. Mr. Van Schaick was a mechanical engineer. At the Rogers Locomotive Works, Philadelphia, he helped build the first locomotives for the West Shore. He helped build the motive power for the Mexican National Railways and spent some time in Mexico, demonstrating the power to the Mexican enginemen when it was put into service. Returning to New York, he entered the employ of the New York Central & Hudson River in 1890, and retired in 1932, since which time, however, he had done special work on assignment for the railroad.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

Tantalum.—The Fansteel Metallurgical Corporation, North Chicago, Ill., has issued a 48-page illustrated book in which technical information about tantalum and its uses are discussed. Tantalum is described as "A rare metal with amazing properties of heat and electrical transference—with unbelievable resistance to the destructive forces of acid corrosion, oxidation and wear."

Electric Welding Products.—Electrodes, arc welding machines and miscellaneous electric welding products, such as helmets, face shields, gloves, etc., are described and illustrated in the 32-page catalog issued by the Air Reduction Sales Company, Lincoln building, New York. A group of tables, especially useful to the welder, are contained in the last section of the catalog.

Brake Shoe Engineering and Research Facilities.—The Sargent Research Laboratory, of the American Brake Shoe & Foundry Co., Mahwah, N. J., describes and illustrates in a four-page bulletin its laboratory which is being equipped with a specially designed brake-shoe testing machine with recording instruments for the testing of brake shoes at maximum train speeds of 160 m.p.h. and wheels loads equivalent to a car weighing 320,000 lb. Mention also is made of their new metallurgical research laboratory, with experimental foundry and machine shop, and modern equipment for chemical and physical testing and heat-treating.

Haynes Stellited Valves.—Haynes Stellited valves for high temperatures and pressures, or for service where corrosion and erosion are encountered, are illustrated and described in an eight-page booklet issued by the Haynes Stellite Company, 205 East Forty-second street, New York.

Metal Coating Process.—The Metals Coating Company of America, 495-497 North Third street, Philadelphia, Pa., has issued File Folders Nos. 1203 and 1204, each of four pages, the former describing the complete molten metal spraying system and the latter describing in detail and illustrating complete MetaLayeR operating equipment.

Ball Bearings and Heavy Duty Roller Bearings.—A comprehensive review of the principles affecting the selection, application and operation of antifriction bearings, and ball bearings in particular, has been prepared by the Fafnir Bearing Company, New Britain, Conn., in the form of a wire-bound engineering manual, No. 35. The book is divided into five sections, and is available to executives and engineers responsible for bearing selection or maintenance.

MARINAC'S RAIL ODDITIES

Marinac has furnished us with the following explanations of the three cartoons which appear elsewhere in this issue.

Page 109. George Krahan received contusions of the right chest in a most unusual accident, which occurred in Fresno, Cal. One of the tires of his car was in some way forced off the wheel as a locomotive was approaching. It struck the locomotive sidewise and rebounded, hitting the driver.

Page 128. The cartoon is self-explanatory. The so-called railroads are of course, quite limited in length, but possibly the term "railroads" can be justified.

Page 129. A quaint village on the Isle of Anglesey, North Wales, boasts of the longest name in that country. It is composed of the following 58 letters: Llanfairpwllgwyngyllgogerychwyrndrobwll-Llantysiliogogogoch. Because of its unusual length the natives call it Llangfair P. G. for short. The illustration shows the railroad station sign being taken down in November. It is removed with great care and stored safely until spring.